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# Zambian elders' experiences and perceptions of the generation gap

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#### **Abstract**

**Objectives.** The study tries to understand the effects of the generation gap on elder people in Zambia using the experiences and perceptions of elder people. It also solicits their views on what the government of Zambia and other stakeholders should do to address the identified issues.

**Material and methods.** The material used in this study was collected by undertaking qualitative research with 90 elder people in Zambia. One-on-one in-depth interviews and focus group discussions were used when collecting the material.

**Results.** From the experiences and perceptions of the participants, the study establishes that generation gap has far reaching negative effects not only on the elder people but also on the whole Zambian society and beyond. For example, it has brought about problems of elder abuse and street elders, which require the interventions of not only the Zambian government but also the international community.

**Conclusions.** The study concludes that the sociological conceptualization of the generation gap differs from the way it is understood by elder people in Zambia. Thus, the inclusion of the voice of the elder people in Zambia in the scientific literature has broadened the thinking about the phenomenon of the generation gap. Based on the findings, policy implications are discussed and areas for future research proposed.

**Keywords**: generation gap, elder people, Zambia.

#### Introduction

Generation gaps exist in every part of the world. However, the existent literature on generation gaps is heavily influenced by the studies done by western researchers and mainly in the western world. The literature on generation gaps with regard to Africa is almost non-existent (Denise, 2002; Cadmus, Owoaje, and Akinyemi, 2015). However, given the differences in the way elderly people live in western countries and the way people live in Africa, and Zambia in particular, the effects of a generation gap on the elderly people might not be the same. This is also possible because of the differences in the way the generation gap is conceptualized. For example, in the available scientific literature which is mainly dominated by western scientists, a generation gap is defined as difference in opinions on music, values, politics, et cetera, that occurs between one generation and another, usually between younger people and their parents and/or grandparents (Denise, 2002; Stepp, 2007). In contrast, in Zambia, generation gap is defined as a situation when many elderly people are living longer than their children, which results in their responsibility of taking care of their grandchildren. This is a reversal of Zambian tradition in which the elderly people are taken care by their children and grandchildren (Senior Citizens Association of Zambia - SCAZ, 2013). Thus, this article seeks to broaden understanding of the concept of the generation gap.

The article is structured in the following way: first, I will define the key concepts of a generation gap and elderly people. I will provide then a theoretical literature review on generation gaps. In the third part, I will identify existing gaps in the available literature on generation gaps, which are meant to sustain my statement of the problem, the aims of my study and the research methodology. The findings and discussions of my study will follow thereafter. Finally, conclusions, policy implications, limitations of the study and areas for future research will be presented.

# Definitions of generation gap and elderly people

There is no universal definition of the generation gap or elderly people. This is because the generation gap and elderly people are social constructs, which means that their conceptions are influenced by complex values, norms, attitudes, history, social and other relationships and interactions that are bound to time and culture, and have different meanings and interpretations in different societies and contexts (Berger and Luckman, 1991). Therefore the concepts of the generation gap and elderly people should be understood within their own contexts, which are always subjective and differ from country to country (Berger and Luckman, 1991; Phelan, 2013). As already said, in western countries sociologists define a generation gap as the differences in lifestyles between one generation and another, and usually between the younger generation and the older generation (Denise, 2002; Stepp, 2007). In contrast, the generation gap in Zambia is defined as a situation where many elderly people are living longer than their children, resulting in many elderly people having the responsibility of taking care of their young grandchildren instead of the elder people being taken care of by their children and grandchildren as required by the Zambian tradition (SCAZ, 2013). In this article, the definition of the generation gap provided by the SCAZ will be used. This is because the article is written on the basis of the experiences and perceptions of the elderly people in Zambia with respect to the phenomenon of the generation gap.

The concept 'elderly people' is also defined in different ways. For example, in western countries, the most commonly accepted definition of old age is chronological age. Since the late 19<sup>th</sup> century, 65 years has been used as a mark for being elderly. In 1873, Germany first used 65 years as a criterion for people to qualify for public social security. Currently, many other western countries are using 65+ years to define an elderly person (Kamwengo, 2004). Another chronological old age definition that is becoming increasingly popular is that provided by the United Nations (UN). The UN agreed age limit is 60+ years to refer to the elderly population (UN, 2007). However, from the perspectives of the elderly people who participated in my study, elderly people in Zambia comprise people who are in their 50s and above. This is because, from 50 years of age, in Zambia, one begins to have gray hair and grandchildren. This means that functional age and life stage definition of an elderly person are the criteria being used by the elderly people in Zambia when defining an elderly person (Kamwengo, 2004).

The above differences in the conceptualization of 'generation gap' and 'elderly people' underscore the earlier argument that the concepts 'generation gap' and 'elderly person' are social constructs. However, because this article is written on the basis of the information collected from elderly people in Zambia, the conceptual definitions of the generation gap and elder people provided by elderly people in Zambia have been used here.

## Theoretical conceptions/literature review on generation gaps

The sociological theory of generation gaps was developed in the 1960's, at a time when the younger generation (later known as Baby Boomers), seemed to rebel against their parents' beliefs

and values (Stepp, 2007). Sociologists have divided the lifespan into different stages: childhood, adolescence, midlife and old age. For example, they theorize that a generation could constitute the following age groups: 46-64; 30-45; 19-29 and 13-18. When discussing the generation gap concept, they look at the following aspects across the above stages: language use, technological influences, and intergenerational relations. Each of these has its own cultural effects (Denise, 2002).

Language use: humanity's most important symbol system is language, the medium through which reality is interpreted (Giddens, 2000). Generations can be distinguished by the differences in their language use. For example, there could be differences in languages between the younger generation and the older generation. As the new generations seek to define themselves as different from the old, they adopt new words and expressions, for example, in the use of slang, an everchanging set of colloquial words and phrases that speakers use to establish or reinforce social identity or cohesiveness within a group or with a trend in society at large (Stepp, 2007). According to Hagestad and Uhlenberg (2005), this generational segregation is of great concern as it fosters ageism and increases the risk of isolation as people age.

Technological influences: technological innovations occur between generations. When this happens, certain technological skills become obsolete (Armour, 2014). Denise (2002) has noted that the term 'communication skills', for example, might mean formal writing and speaking abilities to an older person; but e-mail and instant-messaging to a younger person. This is why some skills like shorthand and cursive are no longer taught in schools as they have been replaced by technological means of note taking and communication (Owen, 2012). Holson (2008) has also observed that children increasingly rely on personal technological devices like smartphones to define themselves and create social circles apart from their families, changing the way they communicate with their parents. Cell phones, instant messaging, and e-mail have encouraged younger users to create their own inventive, quirky and very private written language. That has given them the opportunity to essentially hide in plain sight. They are more connected than ever, but also far more independent. Thus, depending on individual characteristics of the older persons, such as not having someone to introduce and teach them new technology, and physical characteristics like poor eye sights and memory lapses among others (Zambia National Ageing Policy, 2012), the advances in information, communication and technology may result in exclusion and isolation of some elderly people from the mainstream society.

Intergenerational relations: another aspect associated with the generation gap is represented by changes in the values and norms on how family members live. Two factors are associated with these changes: modernization and migration (Cliquet, 1998). Mortality of the elderly people's peers and mortality of extended family members can also be added to intergenerational relations (Reed, 2015). Lesthaeghe (1985) and Inglehart (1989) have reported that modernization has induced important changes in values and norms, characterized by phenomena such as individualization, increased freedom and personal choice of behavioral patterns. Modern living circumstances involving fewer siblings, greater female participation in paid labor, and geographical mobility and migration often exclude an extended family setting or family care network and prevent more particularly multigenerational co-existence. This is especially true in societies that are characterized by relatively weak family links such as in North America and Northern and Central Europe. Elderly people may lose all their childhood friends in their last stage of life. Elderly people may also be left alone by their children, as children migrate to other cities or countries. Consequently, these changes undermine the foundations of the traditional normative systems of the family, bring about anomie, decrease socio-normative control and cause social isolation and loneliness among elderly people (Cliquet, 1998).

Because of the above challenges, solutions that go beyond the family have been envisaged, and one of them is intergenerational living. Intergenerational living is one method being used currently worldwide as a means of combating the above effects of the generation gap on elderly people (Reed, 2015). Prominent among this type of project is a nursing home in Deventer, Netherlands, where students from a local university are provided small, rent-free apartments within the nursing home facility. In exchange, the students volunteer a minimum of 30 hours per month to spend time with the seniors. The students will watch sports with the seniors, celebrate birthdays, and simply keep them company during illnesses and times of distress (Reed, 2015). In part, because of the recognition of the above challenges faced by elder people, the UN (2007) recommends having the Age-Friendly Society, which should be sustained by the society in which elderly people live. This implies a diversity of the ways of addressing the challenges faced by elderly people due to the generation gap (Fook, 2002).

# Gap in literature and statement of the problem

A critical look at the above literature brings out the following gap. The literature is dominated by research undertaken in western countries and by western researchers (Phelan, 2013; Cadmus et.al, 2015). The voices of many elderly people in developing countries such as those in Africa are missing. In part, this is because few African scientists are interested in aging issues (Zambia National Ageing Policy, 2012). It is this gap that actually makes most of the issues discussed in the above literature less relevant to the elderly people in Zambia. This will come out clearly in the section for findings of the study. For example, the issue of slang is less relevant because the majority of the elder people in Zambia are able to communicate effectively using the same primary language with their children and grandchildren.

In light of the above gap, I conducted a study on the generation gap in rural and urban Zambia using elderly people as the key informants.

## **Objectives**

The study had two objectives: (1) to understand the effects of the generation gap on elder people in Zambia using the experiences and perceptions of elderly people, and (2) to get the views of elderly people in Zambia on what the Government of Zambia and other stakeholders should do to address the identified issues.

## Material and methods

This study utilized qualitative research methodology to allow for the voices of elderly people in Zambia who have experienced a generation gap to be heard. Because little is known about the generation gap in Zambia, especially from the experiences and perceptions of elderly people, this grounded approach was preferable (Kabelenga, 2014). One of the distinguishing features of qualitative inquiry is that it allows new insights about the particular issue under investigation. This comes about because the researcher studies the respective phenomenon in depth with the local people with living experience of the phenomenon. The researcher does not go to the people who have experienced the phenomenon with predetermined answers to the phenomenon. Rather, the researcher's orientation is to learn from the people who have experienced the phenomenon (Creswell, 2003). This thinking can also be thought about with reference to the popular adage, which states that 'experience is the best teacher' (Osei-Hwedie, Mwansa, and Mufune, 1990: 95).

Thus, the participants in qualitative research are seen as the researcher's teachers or sources of knowledge (Yin, 2003; Creswell, 2003). In this study, my teachers were elderly people who had experienced a generation gap.

## **Confidentiality**

Because the participants were assured that their names would not be revealed anywhere, the names of the informants have been replaced with aliases/assumed names. However, I have maintained the actual verbatim transcripts from the interviews.

# Type of data collected

The data for this study consisted of one-on-one in-depth interviews and focus group discussions. In addition, it contained a few closed-ended questions. Thus the large chunk of the data that I collected was qualitative in nature and a handful numerical data. Numerical data was collected on the background information about the participants.

#### **Data collection**

Data collection was done during the national consultative workshop field survey on aging and social protection in Zambia, in November 2012. I collected similar data during the senior citizens' national consultative workshop on the draft Zambia national constitution, in August 2013. Both workshops drew elderly people's representatives from all 10 the provinces of Zambia in both rural and urban Zambia. I also collected similar data during the 7 months study (June to December 2014) on aging in rural and urban Zambia. During the studies, open-ended interviews were used. This approach allowed elderly people to freely express themselves about their experiences and perceptions of the generation gap. Digital recorders were used to record the interviews. As back-up for the interviews, three digital recorders were used simultaneously whenever I conducted any interview. A notebook was also used to take notes during the interviews. Before any interview was conducted, the purpose of the study was explained to the participants and those who were willing to participate in the study signed an informed consent form.

## Number of interviews conducted

I conducted 30 in-depth interviews. Of these, 21 were one-on-one in-depth interviews and 9 were focus group discussions (FGDs). On average, each interview lasted between one hour and three hours. I conducted all the interviews myself because I wanted to make sure that I collected all the information that I needed about the effects of the generation gap on the elderly people in Zambia and what the elderly people felt about what needs to be done in order to address the challenges that they were facing as a result of the generation gap.

## **Selection and characteristics of the participants**

With the help of SCAZ and Community Development Workers, a total of 90 participants were purposively selected to participate in the study. The participants were elderly people's representatives from all the 10 provinces of Zambia. The demographic characteristics of the participants were as follows: the age of the participants ranged between 55 and 80 years. The mean

age was 65 years and the median age was 64 years. Of these, 35 were women and 55 were men. This gender imbalance should not be a surprise. In Zambia, like many other African countries, there are more male leaders than female leaders (Kamwengo, 2004). In addition, all the participants had a formal education with the majority having tertiary education and only five had primary education. The interviews were conducted in English with the exception of five interviews that were conducted in local languages [Nyanja, Bemba and kikonde] and later translated to English.

## **Data Analysis**

Data was analyzed manually after transcribing all the 30 interviews using the qualitative data transcribing software called Express Scribe Transcription. I first read each of the 30 transcripts several times to get a sense of the data in its entirety. During the initial reading of the transcripts, open coding procedures were employed, where codes were created from what was present in the data (Pope et al., 2014; Kabelenga, 2014). After identifying initial codes in the transcripts, I moved to focused coding. This involved making decisions about which codes were most relevant to the research aim, discarding codes that were not relevant and combining earlier codes that were similar. Constant comparison was used to look for similarities and differences in categories across the transcripts. Thus, the whole process was a back and forth and as such it was very messy and stressful (Pope, et al., 2014; Kabelenga, 2014).

#### **Results**

# Understandings of the concept of the generation gap

In an attempt to adequately focus my interviews, the first question that I asked the participants in the Focus Group Discussions (FGDs) was: How do you understand the term generation gap as senior citizens? Their understandings can be seen in the narratives below:

"It is a situation where we older people are living longer than our children and resulting into us having the responsibility to look after our grandchildren left behind by our children." (FGD, 1).

"According to our Zambian tradition, our children are supposed to take care of us in our old age. However, this is not happening because most of our children are dying earlier than us. So this is what we call the generation gap." (FGD, 3).

From the above verbatim quotes, it can be argued that how elderly people in Zambia understand the term generation gap is different from the way generation gap is conceptualized in the available scientific literature. As already revealed, sociologists define a generation gap as the differences in values and beliefs between one generation and another, usually between younger people and their parents and/or grandparents (Denise, 2002; Stepp, 2007). This conception is different from the above conceptions of generation gap provided by the participants in Zambia. From the participants' experiences and perceptions, the generation gap here is all about the premature deaths of the current generation of adults, which has left a "gap" between generations. In other words, it has to do with the actual gap created by the deaths of the younger generation or elderly people's children. The aspects that are commonly used in the existing literature when discussing the generation gap concept such as language use and technological advancements (Denise, 2002; Reed, 2015) were not mentioned at all by the participants. It seems that the only

aspect of the generation gap in the existing literature that is relevant to the participants is constituted by intergenerational relations (Lesthaeghe, 1985; Cliquet, 1998). Perhaps this is an indication that the concept of generation gap should be understood within the local context in which particular generations of people live.

## Effects of generation gap on the elderly people in Zambia

The following came out to be the main effects of the generation gap on elderly people: the burden of taking care of the orphaned children; loss of care from their children; death of some elderly people due to depression; elder abuse and street elderly. Below I provide the details of each of these effects.

# Burden of taking care of the orphaned children

From the participants' experiences and perceptions, the generation gap had resulted in many elderly people having the responsibility of taking care of the orphaned grandchildren left behind by their children. This was a burden because most of the elderly people did not have the physical capacity or economic means to provide this care. This was expressed by two participants during FGDs as follows:

"We have big responsibilities to take care of the orphaned grandchildren and this is a big burden to many of us. This is compounded by the fact that most of us are poor. We are not in employment. We have no money and the government is not supporting us in any way." (Ms. B during FGD, 1).

"It has brought about the burden of taking care of grandchildren especially when they are still young. We have this responsibility though we don't have the material resources and strength in our bodies to do so. It is a very big burden." (Mr. T during FGD, 7).

From the above findings, it implies that generation gap as understood by the participants had increased elderly people's responsibilities in Zambian society. They have to take care of orphaned children whilst, at the same time, they have to take care of themselves. From the above narratives, this is happening amidst stressful conditions such as limited material resources and bodily weaknesses associated generally with old age (Kamwengo, 2004). This responsibility can increase physical, economical, psychological and social stress on elderly people.

# Loss of care from the children

The participants also revealed that many elderly people in Zambia depended on the support from their children for their well-being. However, due to the deaths of their children, they had no one to take care of them. The narratives below express the above effect:

"We are supposed to be taken care of by our children and grandchildren. But now the opposite has happened. Our children are dying and leaving us with so many grand and great grandchildren to take care of. Look, I am now 71 years of age, but I am taking care of my parents who are in their 90s and several grandchildren. This is not supposed to be my responsibility but should be the responsibility of my children." (Male Informant aged, 71 years).

"Children are supposed to take care of us, but because of this generation gap, there is no one to take care of us." (FGD, 6).

The above verbatim quotes suggest that, from the experiences and perceptions of the participants, many elder people in Zambia depend on their children for their well-being. This can be expected. In African societies, adult children are expected to take care of their parents in old age. This is why having children is highly valued in Africa (Fuller, 1972; Women and Law in Southern Africa Trust, 1997; Kamwengo, 2004; Zambia National Ageing Policy, 2012). The above result, however, is a sharp contradiction to the widely held view in the literature that most elderly people do not want to depend on their children for the wellbeing (Dooghe et al, 1988). Perhaps such a view applies more to western countries. In Africa, Zambia inclusive, even from the African governments' point of view, children have the responsibility to take care of their aging parents (Kamwengo, 2004; Zambia National Ageing Policy, 2012). Nevertheless, with the existing generation gap, that way of living has been torn apart and now many elderly people are forced to begin to look after themselves even in old age.

## Death of some elderly people due to depression

The death of their children seemed to lead to depression and death in some elderly people. A typical example was that of a 73 years old man who died of depression after losing most of his children through death:

"All my children have died. Who will take care of me? It is better that I also just die." (Mr. K, aged 73 years) (Statement obtained in the 2012 study).

"Mr. K died last year because of depression which arose due to the death of his children. He always used to complain that no one would take care of him since the children who were supposed to look after him were dying. He was just sick for a few days and he died." (Mrs. K, in her 60s).

The above finding qualifies my earlier deduction that in Africa, Zambia inclusive, many people bear children with the view to be taken care of by them in old age (Fuller, 1972; Zambia National Ageing Policy, 2012).

## Elder abuse

Another effect of the generation gap (losing their children) was an increase in the abuse of the elderly people by both family and non-family members. This was because children are supposed to be the primary economic, social and physical protectors of their parents. For example, one participant stated:

"Older people who are abused spiritually, verbally, physically and politically as well as those who are neglected are mainly those who have lost their children. That is because they have no one to protect them from the abusers. Those who have children are rarely abused because if one family member or other people in the neighborhood or village want to abuse that particular old person, some of the children will stand up to defend him or her. But those without children, anyone can abuse them because they know that no one will defend him or her." (Mrs. L during FDG, 7).

The above finding suggests that children in Zambia play a very important role in the welfare of their aging parents. Thus, if parents lose their children, suffering may follow.

# **Street elderly**

It was also learned from the participants that generation gap had brought about the problem of street elderly. Street elderly refers to elderly people whose survival depended on begging on the streets or begging from different households in the neighborhood.

"We now have street elders. Some of the older people on the streets begging are because of the generation gap. They have no one to take care of them and they have no capacity to look after themselves." (FDG, 3).

"They are surviving by moving from one household to the other begging for food, salt..., I tell you, the kind of life that they are living you can cry. In villages, they don't beg on the streets but they do come here [public office] and the explanations they give here is that no one wants to take care of them" [FDG, 1].

From the above finding, it can be argued that the generation gap is producing negative effects which do not only affect the respective elderly people who have lost their children, but also the larger society in which the elderly people live.

## What should be done to address the effects of generation gap on elderly people

The participants suggested the following solutions to the above effects of the generation gap: the introduction of a social pension, the revival of the village concept and the education of young people on life in old age.

## Introduction of a social pension

The participants argued that the Government of Zambia should introduce a social pension for elderly people in Zambia. Social pension means that the Government of Zambia would provide a certain amount of income to elderly people until death. This income would enable the elderly people to afford the basic necessities of life for themselves and their dependent grandchildren. As some of the participants expressed it:

"We want a social pension. If the government can introduce social pension for all the older people in Zambia, most of the problems that we are going through can be addressed." (FGD, 8).

"Social pension should be introduced. Monthly income for all the older people should be introduced. This will help address most of the challenges that we are going through. We will be able to look after ourselves and the orphaned children we are keeping." (Female informant, aged 71).

The above thinking of the participants is also in line with the policy measures suggested by many policy makers and researchers globally on how to improve the welfare of elderly people. Social pension globally is seen as critical in addressing most of the problems associated with old age (Devereux and Sabates-Wheeler, 2004; HelpAge International, 2014).

# Revival of the village concept

Some participants proposed reviving the traditional Zambian way of living where people of the same bloodline lived together in one village and in large numbers. That was seen to have positive implications for elderly people who lose their biological children as other extended family members would be able to at least help such elderly people. Below are some of the representative comments:

"There is a need to revamp the village concept. One way this can be done is to discourage people from living alone. There is also need to develop rural areas to encourage many people to live in their villages." (FGD, 3).

"In the past, people used to live in large villages and that helped a lot. For example, villages were used for physical and social protection of the village members. If one village member or other villages arose against one village member, other village members came to the rescue of their member. So that way of living should be encouraged." (Sub-Chief, aged 55 years).

The above suggests that a return to the Zambian traditional way of living is believed by some participants to address some of the challenges associated with the generation gap. This points to the fact that the extended family system in Zambia should be encouraged (Fuller, 1972; Kamwengo, 2004; Zambia National Ageing Policy, 2012).

## Education of young people about life in old age

Educating the young people about life in old age was also seen to be pivotal in addressing the challenges associated with the generation gap. That was seen to be important in that it would help the younger people to understand some of the common problems associated with old age and what they needed to do whilst there were still young to avoid going through those problems when they grow old. Some participants were of the view that some of the problems they were now facing were due to the fact that they did not prepare themselves adequately for their living in old age. For example, some blamed themselves for the above problems saying that they did not invest in their private and public social protection when they were in formal employment and/or in public offices in charge of making social protection policies.

"There is a need to mainstream aging in the school curriculum. That will help the young generation understand how life in old age is." (FGD, 4).

"There is a need to help the young people begin to invest in their social protection when they are still young. They should get educated, build houses and have also good social protection policies in place. You see, some of us we are to blame for our sufferings. We were in those public offices, but we did not do anything for the older people." (Female informant, aged 71 years).

From the above, it seems that the participants in Zambia were of the view that when thinking about ways of addressing the effects of the generation gap, there is a need not only to target the present generation of elderly people but also target the next generation.

# **Conclusions and policy implications**

On the basis of the findings of this study, the following are the conclusions and policy implications:

First, how the participants in Zambia understand the phenomenon of the generation gap is different from the way a generation gap is understood in sociological literature. This suggests that care must be taken when using this term outside of western contexts or cross-culturally.

Second, from the experiences and perspectives of the participants, a generation gap in Zambia centers on elderly people living longer than their children and not on differences of opinion regarding music, politics, language use or lagging behind in technology. This has many negative effects, which include the burden of taking care of the orphaned children; loss of care from the children; death of some elderly people due to depression; elder abuse; and street elderly. These effects transcend the elderly people themselves to include the whole Zambian society and beyond. This is because addressing the effects of the generation gap on elderly people in Zambia requires not only interventions from the people of Zambia but also the international community. In addition, the findings of this study indicate that the effects of the generation gap on the elderly people, such as isolation, depression, elder abuse and street elderly, are as a result of the death of the elderly people's children and not because of differences in language use or lagging behind in technology.

Third, it seems that the strong belief among Africans that children are supposed to take care of their parents in old age has significantly contributed to the negative effects that many elderly people in Zambia are experiencing. This suggests that there is need to find ways to change this belief among African people. One way of doing this is to encourage African people to invest in other forms of social protection when they are still young.

Fourth, it suggests that programs to improve the welfare of elder people and the orphaned children should be embarked on, scaled-up and prioritized in Zambia. This requires a multi-disciplinary approach that should involve economic empowerment of elderly people and their dependents, broadening the social protection base, which should include social pension and targeted child grants programs, encouraging extended family system and educating young people on life in old age.

#### Limitations

This article is written on the basis of the qualitative data collected from 90 elder people in Zambia. It should be noted that one of the main central aims of any qualitative research inquiry is to provide in-depth information about a particular phenomenon (Pope et al., 2014). Therefore, the revelations made in this article should be cautiously applied to other parts of Zambia and the whole world. For example, although the findings presented in this article are from 90 elderly people drawn from rural and urban Zambia, they should not be generalized to other parts of the world. This is because what may be true in one setting may not be true in other settings.

#### Areas for future research

Future research should focus on understanding how the phenomenon of a generation gap is socially constructed in different parts of the world and from the different perspectives such as the perspectives of elderly people and the perspectives of elderly people's formal and informal caregivers among others. Undertaking separate studies in different regions of the world, for example

in Africa, Asia, Europe, and Latin America among others, can broaden understanding of the phenomenon of the generation gap. This may help inform gerontological education, research and practice as well as local and international policies.

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# Modifications of physical and chemical parameters of the air in the process of food preparation in household kitchens in the Republic of Moldova

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## **Abstract**

**Objectives.** The aim of the study was the evaluation of the air quality in the process of food preparation in rural households of the Republic of Moldova.

**Material and methods.** The study was conducted in three areas of the Republic of Moldova (northern, central and southern areas). We evaluated the temperature, the relative humidity of the air, as well as the carbon dioxide and the carbon monoxide in the air. The measurements were carried out during summertime, with Air Quality Monitor 500 in 4 stages: before the cooking process, one hour after the beginning of the cooking process, at the end of the cooking process and one hour after the end of the cooking process.

**Results.** The air temperature and the relative humidity rose the most in the process of food preparation in the room designed for living. In <sup>3</sup>/<sub>4</sub> of the households, the concentration of the carbon dioxide in the room designed for living surpassed the limit of the norms maximum to 0.3 mg/l. The concentration of carbon monoxide was detected in few cases, especially during food preparation in rooms designed for living and summer kitchens when the fuel sources were biomass and cereal crops residues.

**Conclusions.** Air quality worsens towards the end of the cooking process and in most cases it is maintained over an hour after the end of the preparation process, representing a source of indoor pollution to the whole family.

**Keywords**: air, indoor pollution, chemical parameters, food preparation.

#### Introduction

Perception, however subtle, about perceived indoor air quality, can be the triggering event of an emerging problem. Such perceptions are characterized as stuffy, bad, and dry air, unpleasant odor, dust, or dirt, for example (Schneider, 2008; Saha, et al., 2015). Indoor air pollution remains a large global health threat. One half of the world population, and up to 95% of the population in poor countries, continue to rely on solid fuels, including biomass fuels (wood, dung, agricultural residues) and coal, to meet their energy needs (Bruce, et al., 2006; Saha, et al., 2015; World Health Organization, 2015).

Cooking and heating with solid fuels on open fires or on traditional stoves generates high levels of health-damaging pollutants, such as particulates and carbon monoxide. As women are primarily responsible for cooking and as children often spend time with their mothers while these are engaged in cooking activities, women and young children are primarily affected. For example, the World Health Report (2002) estimates that the acute respiratory infection is one of the leading causes of child mortality in the world, accounting for up to 20% of fatalities among children under five, almost all of them in developing countries. This makes solid fuels the second most important environmental cause of disease after contaminated waterborne diseases and the fourth most important cause of overall excess mortality in developing countries after malnutrition, unsafe sex, and waterborne diseases (Bruce, et al., 2006; Dutta, et al., 2011; Banerjee, et al., 2012).

In addition to impacts on mortality, indoor air pollution may have long-lasting effects on general health and well-being: early exposure to indoor air pollution during childhood may stifle lung development, suggesting that the cost of this pollution may continue later in life. In fact, a growing literature indicates that environmental insults at early ages can have long-lasting influences on human health and productivity (Almond, 2006).

Indoor air pollution due to the indoor burning of polluting fuels has been associated with Acute Lower Respiratory Infections (ALRI) amongst children less than five years old (Barnes, 2005).

Exposure to indoor air pollution has been associated with chronic obstructive pulmonary disease, lung cancer, nasopharyngeal cancer, tuberculosis and diseases of the eye in adults, low birth weight and, of particular concern, acute lower respiratory infections (ALRI) such as pneumonia amongst children less than five (Bruce, et al., 2006; Smith, et al., 2000).

We decided to conduct this research because solid fuel sources are widely used in Moldova.

#### Material and methods

The study was conducted in three areas of the Republic of Moldova (northern, central and southern areas). The research has been based on the determination of some physical and chemical factors of the environment in the process of food preparation. With the help of the Air Quality Monitor 500, there have been measured the temperature and the relative humidity of the air – as physical parameters of the air – and from the chemical factors – the carbon dioxide and the carbon monoxide. The population prepares food in three different spaces (in specially equipped kitchens, in living rooms, or summer kitchens) and outdoors. Out of the 150 researched households - in 46 cases people prepared food in specially equipped kitchens, in 31 cases - directly in the room designed for living (the hobs or stoves), in 48 cases – in the summer kitchen and in 25 cases people prepared the food outdoors. During summertime, 4 measurements have been realized in each of the 150 households. The stages of data collection were the following: before the cooking process (the I stage of measurements), one hour after the cooking process beginning (the II stage of measurements), at the end of the cooking process (the III stage of measurements) and one hour after the end of food preparation (the IV stage of measurements).

In order to assess the conditions of food preparation, a questionnaire was completed using the method of direct interview. From this questionnaire, the answer to only one question was included in the present study – about the sources of fuel used by the population, in order to compare the corresponding concentrations of carbon dioxide for each of them. We have also included in the questionnaire the results of the measurements of air temperature and relative humidity.

The analysis of the results was performed using absolute values with subsequent calculation of indices. In order to specify the degree of significance in comparison to the average values we used the Student test for significance.

To determine the direction and power of the relationship between studied indices we calculated Bravis-Pearson's linear simple correlation coefficient (r). The level of statistical significance of the correlation was established using ANOVA test in the program Statgraphics Plus 2.1. The ANOVA test measures whether a significant factor contributes significantly to the variation of the response and determines the size of the variation that is due to a pure error. If the p-value in the ANOVA table is 0.05 to 0.001, we can say that there is a significant statistical relationship between variables at a confidence level of 95.0 to 99.9%.

#### Results

In order to evaluate the impact of meal preparation conditions on the human body, we have tested two physical factors of the air: temperature and relative humidity.

As far as the temperature of the air is concerned, before the cooking process, it presented values that depended on the temperature of the environmental/outdoor air. On the other hand, an hour after the beginning and at the end of the cooking process, the air temperature increased (regardless of the type of the rooms), and, in most cases, the temperature dropped one hour after finishing the cooking process.

By comparison, the air temperature has increased the most in the case of cooking in the inhabited room. The average value of the temperature one hour after starting to cook rose with  $2.1^{\circ}$ C (p<0.001), and at the end of cooking – with  $4.5^{\circ}$ C (p<0.001). Whereas, an hour after finishing cooking, the air temperature fell with  $2.8^{\circ}$ C (p<0.05). The temperature fell with  $1.8^{\circ}$ C (p<0.001), even in comparison with the beginning of the cooking process. The lowest temperature value an hour after starting cooking was  $20.5^{\circ}$ C, while the maximum value –  $37.4^{\circ}$ C, at the end of the food preparation process, both the maximum and minimum temperatures increased –  $23.8^{\circ}$ C and  $38.3^{\circ}$ C respectively. One hour after the end of food preparation, the minimum temperature value dropped, on average, by  $2.4^{\circ}$ C, but remained higher than the temperature at the beginning and in the middle of the cooking process. The maximum temperature decreased on average by  $4.2^{\circ}$ C.

Furthermore, the average air temperature was higher when cooking outdoors, which was conditioned by high ambient temperature values at that time of the year. In such a setting, an hour after the start of preparing the meals, the average air temperature increased by 1.7°C (from 28.4°C to 30.1°C, p<0.001) and at the end by 4.4°C (from 28.4°C to 32.8°C, p<0.001). What is more, an hour after cooking, the air temperature decreased by 2.9°C (from 29.9°C to 28.4°C, p<0.05), the temperature dropped by 1.5°C (p<0.01) in comparison with the beginning of the cooking process. In the first hour of food preparation, the temperature rose to 25.8°C the least and the most to 34.0°C. At the end of the preparation of meals, the lowest temperature was 26.4 °C and the highest of 36.7°C. However, an hour after the end of cooking, the lowest temperature was 24.1°C and highest 34.5°C, therefore these values were higher than those before starting the cooking process (Table 1).

As mentioned above, during the summer, the population of Moldova cooks mainly in summer kitchens or usual kitchens (specially arranged places in the house). In view of the summer kitchens, the air temperature increased in the first hour by  $1,6^{\circ}$ C (from  $28.9^{\circ}$ C to  $30.5^{\circ}$ C, p<0.001) and until the end of the cooking process by  $3.8^{\circ}$ C (p<0.001), reaching  $32.7^{\circ}$ C. Nonetheless, one hour after the end of the cooking process the temperature decreased by  $2.8^{\circ}$ C (p<0.01) being  $29.9^{\circ}$ C, with only  $1^{\circ}$ C increased in comparison with the one recorded at the beginning of the cooking process (p<0.01). The minimum temperature value, which was recorded one hour after the

beginning of food preparation, was 24.7°C, while the maximum was 34.4°C. At the end of the food preparation, the minimum temperature was 26.2°C, while the maximum was 38.5°C (Table 1).

Apart from that, the smallest rise of the temperature was registered in the kitchens, because they were specially equipped rooms that had windows (44% of the rooms had functional windows), some also had ventilation systems (17% had a hood, only half of which being functional at the moment; and 11% had a ventilation duct), but in the same time, the temperature returned slower to the initial values after the cooking process, probably on account of the room, which in most cases did not have a direct way out (87%), besides, not all the rooms had windows (28% of the kitchens were without windows).

In settings such as specially equipped kitchens, one hour after the beginning of the food preparation process the average air temperature rose by 1.4°C (from 27.6°C to 29.0°C, p<0.05) and at the end by 3.2°C (up to 30.8°C, p<0.001). One hour after the end of the cooking process, the average air temperature dropped by 2.1°C (p<0.001), and compared with the middle of the cooking process by 1.1°C (p<0.001). Finally, at the end of the cooking process, the minimum temperature was 26.2°C and increased by 2.4°C in comparison with the initial one, being the highest increase compared to cases where food is prepared in rooms designed for living, summer kitchens and outdoors. The maximum temperature in the kitchens reached values of 38.5°C, registering the lowest growth (6.4°C) compared to cooking in other areas (Table 1).

Table 1. Average, minimum and maximum air temperature values in the cooking process

	d parameters	The air temperature (°C)			
Cooking in:		$T_1$	$T_2$	$T_3$	$T_4$
specially equipped kitchens	M±m	27.6±0.26	29.0±0.29***	30.8±0.39*	28.7±0.24*x
	Min	23.8	24.7*	26.2*	24.5**
	Max	32.1	34.4**	38.5*	33.5*
in the room	$M\pm m$	26.4±0.61	28.5±0.72*	31.0±0.75*	28.2±0.60****¤
designed for	Min	19.5	20.5**	23.8*	21.4*
living	max	32.4	37.4*	38.3*	34.1**
summer kitchens	M±m	$28.9 \pm 0.26$	30.5±0.35*	32.7±0.47**	29.9±0.31***xxx
	min	24.8	26.3***	$28.0^{*}$	24.3*
	max	32.6	35.1*	39.4*	34.1**
outdoors	$M\pm m$	28.4±0.51	30.1±0.43*	32.8±0.46*	29.9±0.51************************************
	min	23.6	25.8*	26.4*	24.1**
	max	33.4	34.0*	36.7*	34.5***

Note:  $T_1$  – before cooking;  $T_2$  – an hour after starting cooking;  $T_3$  – at the end of cooking;  $T_4$  – an hour after the end of cooking. p < 0.001. p < 0.001.

When cooking in the room designed for living, records indicated that in the first hour of food preparation, humidity increased on average by 3.2% (from 49.7% to 52.9%, p<0.001) and, at the end, by 7.6% (up to 57.3%. p<0.01). An hour after finishing the cooking process, relative humidity decreased by 3.7% (p<0.05) and compared to the middle of process decreased by 3.9%. By contrast, when cooking outdoors the relative humidity increased in one hour by 2.3% (p<0.01), and by 5.1% at the end of the cooking process (p<0.01). An hour after cooking, relative humidity decreased by 2.4% (p<0.05) and, compared with the beginning of the process, by 2.7% (p<0.001). The minimum value of relative humidity in one hour from the beginning of cooking was 41.2%, being lower than at the beginning by 1.5%. The maximum value was 60.1%, being by 2.9% higher than at the beginning of the cooking process. Thus, both minimum and maximum values of humidity

registered in the living room after cooking (where 21% of the population prepared the food during the summer) had shown higher fluctuations, in comparison with records from other areas of cooking, except the outdoors, where the maximum value increased over 4.3%). At the end of meal preparation, the minimum relative humidity was 42.3%, being decreased by 0.4%, compared to the beginning of the cooking process, while the maximum value reached 69.9%, therefore being the highest increase since the beginning of cooking compared to other spaces. One hour after the completion of cooking, the minimum value of the relative humidity decreased by 0.6% compared to the end of the processes and by 1.0% compared to its beginning. The maximum value decreased by 6.2% compared to the end of the cooking but remained higher by 6.5% compared to the beginning of the preparation of meals (Table 2).

Out of the two rooms designed for cooking during summer, the biggest changes are in the summer kitchens. There, the humidity increased by 1.6% (from 47.3% to 48.9%. p<0.001) in the middle and by 3.4% (from 47.3% to 50.7%. p<0.05) at the end of the cooking process, and one hour later it decreased by 1.8% (p<0.01). The changes of the minimum and maximum values were also more common in summer kitchens compared to kitchens designed in specially equipped kitchens (0.05<p<0.001). In summer kitchens, the minimum value of humidity followed a lowering trend, decreasing up to 40.7% one hour after the start of preparation, while the maximum value increased up to 58.6% during the same amount of time. At the end of cooking process, the minimum relative humidity was 40.1% and decreased by 0.9% compared to the beginning of the cooking. The maximum value was 63.2% and remained higher than at the beginning by 7.0%. Both absolute values and the differences in values were lower in the case of cooking in the summer kitchen compared to cooking in rooms designed for living, probably because summer kitchens are not hermetic spaces, having direct exit outdoors. One hour after the end of food preparation, the minimum and the maximum values of the relative humidity decreased compared with both the end and the initial phase of the cooking process (0.05<p>0.01) (Table 2).

Consequently, from all four places used for food preparation, the relative humidity increased less in the case of kitchens. During the first hour, the relative humidity increased by 0.7% (from 48.5% to 49.2%, p<0.05) and by 2.5% at the end of the cooking process (p<0.001). One hour after cooking, the humidity decreased by 2.5% (p<0.001), being 51.0%, the lowest value recorded in all cooking areas. The minimum humidity value slightly increased during preparation, by 0.3% in the first hour and by 0.8% at the end of cooking. One hour after the end, the minimum value decreased by 0.6% compared to the end of the cooking process and remained by 0.2% higher than at the beginning. The maximum value was 65.0%, being the highest value recorded in all cooking areas, but the dynamic of the changes was not the biggest – it decreased by 3.0% compared to the end of cooking, but remained 5.0% higher compared to the initial moment. Such a high value is explained by the fact that during summer the ventilation in the kitchen is achieved only by means of the windows, and space does not have a direct exit outside (Table 2).

Nevertheless, when cooking outdoors, the relative air humidity one hour after starting the process was equivalent to the value recorded at cooking in specially equipped kitchens (49.2%), being slightly higher than the one recorded when cooking in summer kitchens (by 0.3%) and lower than the one recorded in rooms designed for living (4.1%) 0.01<p<0.001. The humidity increased by 2.3% (p<0.01) during the first hour of cooking (up to 49.2%), and by 5.1% (p<0.001) at the end of the process (up to 52.0%). An hour after the completion of cooking, the relative humidity decreased by 2.4% (p<0.001), but remained higher by 2.7% (p<0.05) compared to initial time. The minimum relative humidity value at all stages was the lowest compared to other spaces for cooking. The lowest recorded value was higher by 0.8% one hour from starting meal preparation, and by 1.7% at the end of the process, while an hour after cooking it was lower by 3.0% compared with the starting

point. The maximum value was 61.6% in one hour from the beginning of cooking; it reached 66.2% at the end of the preparation and decreased to 62.1% one hour after the end of the process (Table 2).

Table 2. Mean, minimum and maximum values of humidity in the process of cooking

	d parameters	The relative humidity of the air (%)			
Cooking in:		$T_1$	$T_2$	$T_3$	$T_4$
specially	M±m	48.5±1.10	49.2±0.95***	51.0±2.05*	49.1±1.14*¤
equipped	min	37.9	38.2***	38.7**	38.1*
kitchens	max	60.0	60.0*	$68.0^{*}$	65.0*
in the room	M±m	49.7±0.05	52.9±1.14*	57.3±1.53**	53.6±1.07****
designed for	min	42.7	41.2**	42.3*	41.7**
living	max	57.2	60.1*	69.9**	63.7*
summer kitchens	M±m	47.3±1.63	48.9±2.11**	50.7±1.16***	48.9±1.37***ggg
	min	41.0	40.7**	40.1**	39.7*
	max	56.2	58.6*	63.2*	56.0***
outdoors	M±m	46.9±1.12	49.2±0.85**	52.0±1.41*	49.6±1.32***
	min	34.0	34.8**	35.7*	32.7*
	max	57.3	61.6*	66.2*	62.1*

Note:  $T_1$  – before cooking;  $T_2$  – an hour after starting cooking;  $T_3$  – at the end of cooking;  $T_4$  – an hour after the end of cooking. p < 0.001. p <

There is a reason to believe that in most cases the increasing of the air humidity depends on the type of products that are prepared, as well as on the humidity of the air.

As far as the chemical factors are concerned, there have been studied the carbon dioxide and monoxide. The concentration of the carbon dioxide before cooking meals was within the normal limits, except in the inhabited rooms. In ¾ of in the room designed for living, the concentration of the carbon dioxide surpassed the normal limits up to 0.3%. Calculating the average concentration of the carbon dioxide in each type of rooms, one hour after the beginning of food preparation process, we established that the limits had been surpassed in each of the cases: in kitchens - 0.18%, in inhabited rooms and summer kitchens - 0.17% and in the case of preparing dishes outdoors - 0.16%. The maximum concentration value of carbon dioxide in kitchens was 0.5 mg/l, recorded only in a room, also values of 0.28 and 0.27% were recorded in other rooms, in most of the cases, the maximum value was 0.21%. In the rooms designed for living, the maximum concentration value of carbon dioxide was 0.20% and 0.21 and 0.25% in some rooms. In two summer kitchens, the maximum value of 0.27% was recorded, in some rooms - 0.25 and 0.24%. As for the outdoor cooking, the values are even higher: 0.30 and 0.32% in cases when wood and leftover cereals were used as fuel (Table 3).

Meanwhile, at the end of food preparation process, the average amount of carbon dioxide was greater than 0.2 mg/l in all cooking areas. The highest value was recorded in the room designed for living - 0.242 mg/l as the average of all measurements. It stands to reason that this exceeding can be justified by the fact that these spaces have a lower height and smaller volume, few rooms had ventilation hoods (only 2 of 31), two rooms had no windows, and in six rooms the windows could not be opened. The lowest value (0.214 mg/l) was registered when cooking outdoors, but also it exceeds more than twice the normal limits, especially when the fuel source was constituted of wood (r = 0.68), biomass (r = 0.79) and cereal crop residues (r = 0.73).

By comparison, when cooking in summer kitchens and rooms designed for living, the concentration of carbon dioxide exceeded the normal limits even judging by the recorded minimum

value (0.13 and 0.12 mg/l, respectively). Considering the maximum value, the concentration of carbon dioxide exceeded the norm in all food preparation areas. The highest value was in the case of outdoor meals preparation (0.4 mg/l), also influenced by the type of fuel used – wood (r = 0.61), cereal crops residue (r = 0.75), biomass (r = 0.66), while the lowest value was recorded in the kitchen areas (0.36 mg/l), which are better-designed spaces.

Table 3. Mean, maximum and minimum values of concentration of carbon dioxide in the

process	Λť	COO	kinσ
PIOCEBB	O.	COO	

Researched parameters		The carbon dioxide (mg/l)			
Cooking in:		$T_1$	$T_2$	$T_3$	$T_4$
specially	M±m	$0.104\pm0.80$	0.177±0.87*	0.239±1.21*	$0.150\pm0.95^{*mm}$
equipped	min	0.030	0.070***	$0.080^{*}$	$0.070^{*}$
kitchens	max	0.300	$0.500^{*}$	$0.360^{**}$	0.300**
in the room	M±m	0.105±0.61	0.166±0.83*	0.242±1.20*	0.149±0.96****
designed for	min	0.010	$0.010^{*}$	$0.130^{*}$	$0.020^{*}$
living	max	0.200	0.250**	0.390**	0.310*
summer kitchens	M±m	$0.094\pm0.48$	0.172±0.56*	$0.239\pm0.72^*$	0.139±0.54***
	min	0.010	$0.009^{*}$	0.120***	$0.010^{*}$
	max	0.200	$0.270^{*}$	0.370**	$0.290^{*}$
outdoors	M±m	$0.094\pm0.94$	0.164±1.06*	0.214±1.22*	0.120±1.20*x
	min	0.030	$0.060^{*}$	0.030***	0.007**
	max	0.210	0.320**	$0.400^{*}$	$0.280^{*}$

Note:  $T_1$  – before cooking;  $T_2$  – an hour after starting cooking;  $T_3$  – at the end of cooking;  $T_4$  – an hour after the end of cooking .\* p < 0.001. \*\*\*\* p < 0.01. \*\*\*\* p < 0.05. (for  $T_2$ - $T_1$ ;  $T_3$ - $T_1$ ;  $T_4$ - $T_1$ ) \*\*\* p < 0.001. \*\*\*\* p < 0.05. (for  $T_4$ - $T_3$ )

To sum up, the concentration of carbon monoxide was detected in few cases (values exceeding normal limits were recorded in 5 households), especially when preparing food in rooms designed for living and summer kitchen, when the fuel source was composed of biomass and residues of cereal crops. On the other hand, if the evaluation had been realized during the winter, there would have been probably many more results with high concentrations of carbon monoxide.

#### **Conclusions**

One of the most striking aspects of this problem is that only a reduced number of the population in Moldova has rooms exclusively for cooking, in other words corresponding to the hygienic norms. Added to that, much better conditions are confirmed in areas provided with natural gas pipelines, and with good ventilation systems.

Cooking in a living room (especially in winter) leads to supplementary pollution of the air in the living space; the situation is maintained by a traditional fuel-saving strategy: thermal preparation of the food is carried out, while at the same time economizing on space heating.

Moreover, the huge amount of people who cook in rooms that don't correspond to hygienic norms (with no ventilation or improper cooking installations) is at great risk of pneumonia, bronchitis, obstructive bronchitis, or even ischemic heart diseases. All the same, smoking is a supplementary factor that has to be taken into account.

Finally, the current study was initiated because the Moldavian population does not have satisfactory conditions for food preparation, using fuel sources that are harmful to health, which are

premises that damage children's health. The results of the research come with arguments and recommendations for the population, in order to decrease the bad impact on people's health.

Regarding all this data, we recommend increasing the level of information and education among the people of the Republic of Moldova by the means of efficient programs and community intervention projects, in order to raise public awareness of the exposure risks and to stimulate the adaptation of living conditions to a proper indoor environment.

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# Evaluation of the surgical management and remote outcomes in patients with postoperative biliary strictures in the Republic of Moldova

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#### **Abstract**

**Objectives.** Surgical management of patients with benign biliary strictures and biliary lesions is a current issue for discussion and raises many scientific research directions. The purpose of this study was to systematize our experience in the treatment of benign biliary strictures, analyzing both immediate and remote complex results.

**Material and methods.** Between 1989-2015 years, there were 203 hospitalized patients with benign biliary strictures in Surgery Department no. 2 of Public Institution, State Medical, and Pharmaceutical University (PI SMPhU) "Nicolae Testemitanu". The study is conducted as part of postdoctoral research; thesis/dissertation title is *Clinical-functional efficiency of modern surgical treatment of benign biliary strictures according to immediate and remote clinical results* and was approved by the Science Council of PI SMPhU "Nicolae Testemiţanu" and Ethical Committee (EC) of Ministry of Health (MoH). Clinical evaluation included several consecutive steps: 1) setting the etiopathogenic diagnosis; 2) pre-operatory decompression of the biliary tree; 3) reconstructive surgical act. In the case of biliary strictures, after the initial assessment, biliodigestive derivations were performed according to the level of the obstacle, preferring the bilio-jejunal anastomosis with a Roux-en-Y excluded loop. The post-operatory mortality was 2.63%.

**Conclusions.** The iatrogenic stricture of bile duct has a complicated evolution, with many surgeries, requiring many hospitalizations. It should be endeavored to detect them in a timely manner and to prevent septic complications. In the first phase, biliary tree decompression will be used, and after decreasing the inflammatory process biliary-digestive reconstruction will be performed. These patients require a complex remote monitoring and analysis of health status.

**Keywords**: biliary strictures; etiopathogenic diagnosis; hepaticojejunostomy; reconstructive surgery act; biliary duct.

## Introduction

Bile duct lesions that occur most often after a cholecystectomy, present a formidable challenge for surgical services that require a complex approach for optimal management. If the injury is not recognized in time or has been poorly managed, then serious complications can occur, such as cholangitis, biliary cirrhosis or portal hypertension. These complications involve considerable a cost for treatment, loss of employment and long-term disability (Sadiq, et al., 2012; DeSantibanes, et al., 2008).

The incidence of biliary injuries during open cholecystectomy is reported to be about 0.1-0.2% (Sadiq, et al., 2012; Laura, et al., 2013). The incidence of biliary injuries during laparoscopic cholecystectomy is certainly greater than the one following open cholecystectomy and according to published data varies between 0.4-0.6% (Turcu, et al., 2011; Laura, et al., 2013; DeSantibanes, et al., 2008). It is also noteworthy that after laparoscopic cholecystectomy bile injuries are more severe and complex than those encountered during an open cholecystectomy (Lau, et al., 2007).

In order to define the types of biliary lesions (BL), there have been proposed several classifications of BL, but none is universally accepted because each has its own limitations. Among them, a fundamental role is played by Bismuth's classification and Strasberg's classification, which are most commonly used by practitioners. Bismuth's classification addresses the group of patients presenting an established biliary stricture and distributes patients based on the level of damage, which is a determining factor of the evolutionary result (Bismuth, et al., 2001). Dr. Sikora amended type III strictures in type IIIa / IIIb, according to Bismuth, depending on the level of confluence of hepatic ducts, being intact or destroyed (Sikora, et al., 2003). Strasberg's classification applies to acute injury with bile leaks, lateral damage and sectioning (Strasberg, et al., 1995). A subgroup of transections (type E according to Strasberg) incorporates Bismuth classification. The major disadvantage of these classifications is that some important factors affecting the result are not presented, such as the vascular lesions, time until recognition of the damage, the presence of biliary fistula (internal/external), portal hypertension, liver function, and the presence or absence of previous reparatory operations. The Hannover classification is the most refined in terms of the combination of classification of Strasberg and Bismuth and is addressed directly to the assessment of biliary-vascular lesions (Bektas, et al., 2007). Hopefully a comprehensive classification system, universally accepted at all levels of surgical services, will be proposed in the near future and will mandatorily include all the relevant parameters that influence long-term outcome (Lau, et al., 2007).

A detailed clinical evaluation and a thorough preoperative preparation are important factors for a successful management of a patient with BL. The major preoperative aim is to document the degree of liver dysfunction, to establish the exact level and type of stricture, the presence or absence of biliary infection, and to investigate possible complications such as secondary biliary cirrhosis and portal hypertension or possible biliary fistula. Besides BL diagnosis, it is also equally important to detect the associated medical risk factors, especially liver disease coexistence, electrolyte dysfunction, coagulation, metabolic or in association with infection disorders.

In this context, our study focuses on what happens after the damage has already been produced and the surgical modality for solving the existing problems. The moment of BL repairs is critical, especially when we realize that the first attempt to repair is the best in terms of long-term outcome. The outcome of main bile duct injury is an increase of diameter, wall thickening, an increase in proliferative connective cells and an increase in elastic fibers. One important relevant aspect is the presence of inflammatory infiltrate in the wall of bile duct wall. In an elective situation, a minimum period of 3 months after the injury and reconstruction is optimal for the resolution of edema and tissue inflammation from the biliary-hepatic region and for a proximal dilatation of the biliary tree (DeSantibanes, et al., 2008; Keith, et al., 2000). In patients with an total external biliary fistula, the interval from injury to reconstruction can be extended to six months, in order to provide the appropriate surgical management, which will ensure the return of externalized bile in the digestive tract, avoiding electrolyte disturbances and development of acholia (Hotineanu, Ferdohleb, et al., 2005). Unjustified haste in trying to solve an injury at an early stage by reconstruction is associated with a high risk of bile leak postoperatively - 30%, forming a distant stricture - 25% and a high mortality - 30% (Sadiq, et al., 2012; Jacques, et al., 2001).

The aim of the management of bile stricture is to restore the flow of bile in the gastrointestinal tract through a bypass that prevents reflux cholangitis, biliary sludge duct which is formed due to stasis and the formation of gallstones, re-stricture of the bile duct or chronic progressive liver injury. The surgical reconstruction is superior to other techniques, such as percutaneous or endoscopic (balloon dilation or stenting). Hepaticojejunostomy (HJA) is the gold standard in the treatment of biliary strictures. The key surgical principles associated with a successful reconstruction of biliary stricture are the exposure of healthy, well-vascularized stump bile that drains the entire liver, and preparation of a corresponding segment of intestine (usually a loop Roux-en-Y of jejunum> 80 cm) to make close edges and tension free anastomosis – mucosa to mucosa (Han Liu, et al., 2015; Nagino, et al., 2002). Hepp-Couinaud technique for accessing the left hepatic duct under the base of the quadratus lobe enables repair of high lesions, performing a bypass with reliable results. A side-to-side HJA, performed through a longitudinal incision of the left hepatic duct, produces a large anastomosis, minimizes the dissection behind the biliary tract and reduces the risk of excessive devascularization of liver ducts (Winslow, et al., 2009; Bachellier, et al., 2001).

The data from a few tertiary centers presents the postoperative mortality ranging from 5% to 8% (Leslie, et al., 2012). In the last decade, with perfected surgical techniques and management of biliary strictures addressed, there is a considerable decrease in operative mortality with many consistent series reporting *zero* perioperative deaths (Mercado, et al., 2011). Risk factors adversely affecting the survival rate are age, repeated reconstructive surgery, significant comorbid medical condition, sepsis, bile, and secondary biliary cirrhosis.

Several factors must be considered when discussing the long-term outcomes after reconstruction addressed to biliary strictures. Several tertiary care centers reported a satisfactory result in 80-90% of patients. Important factors, presented at scientific forums, underline that predictors of adverse outcome typically include proximal strictures (Bismuth type 3 and 4), multiple previous attempts of reconstruction, presence of parenchymal liver disease, portal hypertension, difficult biliary anastomosis, biliary sepsis, lack of experience of the surgeon (Sadiq, et al., 2012; Sikora, et al., 2008).

Psychosocial repercussions of BL are high; most patients are in the most productive years of their lives. When faced with a serious post-operative complication, requiring major surgical reconstruction carried out by several specialists, a program with integrity assessment and rehabilitation is needed, being a major cost to the health system. Despite the excellent results in long-term reconstructive surgery, Quality of life (QoL) is modest and not well documented. Current studies are often incomplete and do not allow these goals to be established on this difficult issue.

## Materials and methods

The study is conducted as part of postdoctoral research; thesis/dissertation title is *Clinical-functional efficiency of modern surgical treatment of benign-biliary strictures according to immediate and remote clinical results* and was approved by the Science Council of Public Institution, Stat Medical and Pharmaceutical University (PI SMPhU) "Nicolae Testemiţanu" and Ethical Committee (EC) of Ministry of Health (MoH).

The sample was composed by 203 patients with iatrogenic biliary lesions secondary to laparoscopic or open cholecystectomy, gastric resections, admitted at the Surgery Clinic no. 2 between the 1989-2015 years, were looked after (Figure 1).

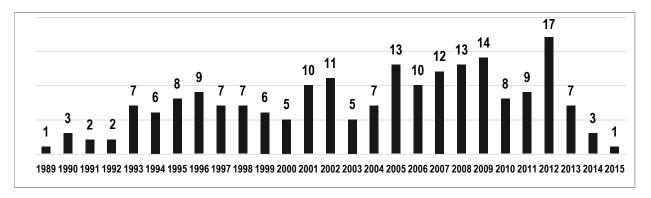


Figure 1. Distribution of the evaluated cases over the years, no. abs.

Most patients came from other surgical services though also from Surgery Clinic no.2. The author noticed the stage of immediate detection of biliary tree lesion, followed by the reparatory stage, aimed to restore the integrity of the biliary tree with plastic elements (external drainage) of bile duct wall and bile duct drainage on the outside and inside. The first stage followed by the period of elimination of infection foci of local septic complications, of biliary sepsis, jaundice, correction of liver function. This lesional period was followed by a period of 3 months, which in some difficult cases extending up to 6 and even 12 months when patients received care at their residence and preparatory treatment for the reconstructive stage.

According to the sex of the patients, a preponderance of biliary lesions in women was established, with a ratio of M/F = 1/4.49 that corresponds proportionately to the number of cholecystectomies performed. Conversely, male patients frequently present cholecystitis of greater difficulty, gangrenous cholecystitis, destructive cholecystitis with per-vesical abscesses, generating a ratio of 76 M to 40 F. In the study group, 93 (45.8%) of the patients with biliary lesions underwent surgery for acute cholecystitis. Inflammation and swelling made the tissues more friable, vascular and biliary elements more difficult to identify and thus the entire area of the triangle Calot more vulnerable.

The average age of patients was 49.13±0.89 years, showing the prevalence of working population, which obviously had a significant social impact. The age varied between 21-78 years. The patients aged under 50 years represent about 50% of the cases; 91 cases (44.8%) were iatrogenic injuries secondary to open cholecystectomy - usually, cases of acute cholecystitis or situations of major fibrosis with deformation of the report of the gallbladder and bile vascularcomplex. The complexity of the majority of cases required their resolution in open access, often during night hours with inadequate anesthetic relaxing, with inaccessible space under the liver, and adding to that a possible inadequate sized incision. In 107 cases (52.7%), lesions were secondary to laparoscopic cholecystectomy. Often these situations are generated by sclera-atrophic cholecystitis, anatomical abnormalities, intraoperative bleeding. Gastric resections for complicated ulcers with penetration caused iatrogenic lesions in only 5 cases (2.5%). The studied cases were classified according to the injury of the biliary tree. Statistical evaluation of time when the lesions took place, helped to elucidate the presence of unexpected injuries and another phenomenon that facilitated the emergence of a possible injury. We called this the human factor, namely the periodic fatigue. It is cumulative and precedes the traditional holidays, reaching the maximum before winter or spring vacations. Certainly, fatigue phenomenon could only facilitate but is not a decisive factor for bile duct injury. This phenomenon does not show any significant gender difference. It is generally a unique phenomenon due to its ethiology.

Injuries included full or partial transections of the main bile duct and damage of right and left liver channels. According to Strasberg's classification, 98% of the lesions were major ones, belonging to the D-E classes. One group of lesions was represented by those with complete bile duct injury, essentially by clamping, suturing or transection of the main biliary duct (MBD). Another group was composed by those where injury of MBD was partial, leaving the possibility of communication with the distal part of MBD. This is of particular importance for the eventual possibility of setting the block through minimally invasive methods.

Major injuries of E type according to Strasberg classification occurred as a result of a misinterpretation of the local anatomy and given the infundibular fibrosis and bleeding motivated by variations of the cystic artery and its report with the cystic duct.

Usually, in these cases, the surgeons were experienced, proficient in laparoscopic techniques. Scenarios of lesions E type were that main bile duct was mistaken for the cystic duct and then clamped and transectioned. D type lesions were usually a destructed cholecyst with major edema in the region of the hepatic pedicle, with modified anatomy or the presence of a scleroatrophic cholecystitis with an intrahepatic location, presenting severe changes of the anatomic pattern in the region of Calot triangle. Often in these situations there was the need for excessive electrocautery, even when manipulating on MBD wall, favoring the formation of bedsores in the future with any bile leaks.

At this stage, the moment of BL detection is very important in the surgical strategy. The most interesting observation is that the remote result is directly proportional to the time of lesion detection and the type of injury. Diagnosis within 24 hours can avoid local septic complications, the progression of mechanical jaundice and liver failure. We received an immediate assessment of lesions in 16 cases (7.9%) and a delayed diagnosis in 187 cases (92.1%). Immediate appreciation in 16 cases (7.9%) allowed us to avoid septic complications, cholangitis in the postoperative period. Late diagnoses were usually established in the surgical departments from the territory when the consulting specialist was invited from university clinics.

Analyzing the data, we can assert that there is no correlation between total or partial damage when immediate detected. We examined a group with a prevalence of biliary lesions detection within 4-7 days. During this period, local septic complications, biliary peritonitis, and eminent jaundice were already recorded. There are patients where postoperative clinical evolution was examined and detection was made when severe septic complications were already present. This is due to the evolutionary specificity of biliary peritonitis, for which hyperdynamic septic shock is clinically unlikely. The group where the lesion was detected during a period exceeding eight days was formed by patients who developed external biliary fistulas, a reason for transferring them to a tertiary center for diagnosis. Their postoperative clinical evolution was satisfactory, with only a drain on safety bilious discharges. As a side note, the postoperative septic complications were not evaluated in these patients.

Laparoscopic surgery has changed the whole mechanism of injury. We found such type of damage as total or partial clipping, total transection of MBD, or excessive electrocautery. The direct assessment can be made only by the surgeon who performs the correction operation. Often, the procedure is performed during night hours, in local hospitals. The details of the mechanism are hidden by the medical staff for ethical reasons, often disregarding the gravity of local septic process, which makes it difficult to observe the real statistics of this complication frequency. We classified the lesion types grouping them into total and partial lesions, which could be achieved through analysis of patient charts, surgical protocols, etc.

In the study group, 187 cases (92.12%) were transferred to the clinic from other surgical services. The rest was represented by the clinic's own patients - 16 cases (7.88%), which constituted

0.05% of all cases of cholecystectomies performed during that period in the clinic. Once the suspected lesion was confirmed, an indication for emergency reconstructive surgery was made, aiming to restore the bile flow and biliary tree drainage, as well as to prevent major septic complications. Usually, in the clinic, there is a 24 hours evaluation period for the lesion. The range of immediate interventions included both classic operations such as MBD plasty CBP with Robson or Kehr drainage, external hepaticostomy with micro-jejunostomy type Delany, minimally invasive endoscopic interventions - stricture dilation with a balloon, endoscopic stents in stages.

For the diagnostic of biliary lesions, a series of investigations were carried out: blood samples analysis, instrumental examinations (sonography, ERCP, CT, MRI, relaparoscopy). In laboratory tests, cholestasis indicators of liver function such as bilirubin, AlkalinePhosphatase (AP), GammaGlutamylTransPeptidase (GGTP), ALanineTransaminase (ALT) and ASpartateTransaminase (AST) are the most useful. In patients with lesions, cholestasis and biliary stenosis, changes are recorded for the following parameters: serum bilirubin, AP, GGT are raised; transaminases indicators will not be modified if the liver is not affected and there is no cytolysis; elevated transaminases indicate damage to the liver parenchyma and secondary development of hypoalbuminemia or biliary cirrhosis; prolonged prothrombin time occurs due to impaired liver synthetic function.

Any reconstruction of bile duct must meet the following requirements: a) fibrous tissue excision of proximal bile; b) providing a broad anastomosis; c) the presence of intact mucosa with no inflammatory processes at all 360° of the anastomosis line; d) a good vascularization of the suture line; e) lack of tension on the anastomosis line. Any surgeon should aim to respect completely these principles. Definitely, there are difficult cases where it is practically impossible to achieve all the criteria. It is undisputed that scar tissue excision and exclusion of tension on the anastomosis level can be obtained almost always.

In situations when these principles are not respected, due to the complexity of the case, it is recommended to use Hepp-Couinaud or Smith Marlow techniques. Application of the anastomosis suture line will be made termino-lateral to the intestinal loop. Atraumatic sutures will allow the installation of a qualitative biliojejunal anastomosis in a single plane. After finishing the posterior lip, if the bile duct is less than 15 mm, it is required to drain the mouth of the anastomosis. The experience of recent decades has allowed refusal from drainages in "U", because these drainages are very traumatic and keeping them long in the biliary tree promotes chronic cholangitis and facilitates biliary cirrhosis. Their use is very limited and concerns cases where it is impossible to apply a functional anastomosis due to a high risk of stenosis at distance. Currently, draining of the anastomosis mouth with good hydrodynamic effects and with minimally traumatic to the biliary tree is popular. Based on our experience, we give priority to Veolker process. Typically, a silicone tubing size 16 Fr is used. Duration of keeping the drain tube is individual, usually not exceeding six weeks (Figure 2).

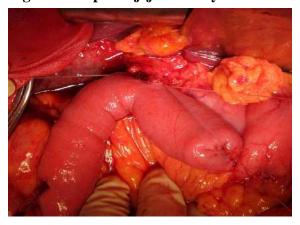


Figure 2. Hepaticojejunostomy anastomosis with Veolker drainage.

For type I and II Bismuth strictures, resorting to a choledochojejunostomy, creating a Roux-en-Y end-to-side anastomosis, it is already a recognized standard. Usually, in this situation we encounteres a pretty "long" stump, which adjusts well to the intestinal mucosa, thus consolidating the anastomosis. The surgeon has a choledoc of sufficient length for maneuvers of bile stump in order to apply the suture, only on healthy tissues. In 82 cases (40.4%) with the Type I and II strictures we used choledochojejunal anastomosis drained by means of a Völker drain. At 16 patients (7.9%) we observed a dilatation of the common bile duct over 2 cm and a local anatomy that was favorable, which allowed us to refrain from transanastomotic drainage.

For high Bismuth strictures, either type III and IV, hepaticojejunostomy has to overcome greater challenges such as a small bile stump and a major fibrosis process. For such situations, Hepp-Couinaud technique has been proposed. The edge of III liver segment and hepatogastric ligament will be prepared intraoperatively. In the place where hepatogastric ligament passes into Glisson's fascia, a hilar plaque is formed. The hilar plaque is prepared and through its intersection, the junction of liver channels will be reached. The dissection will continue on the left duct the latter being maximally denuded of tissue. The method is based on the fact that the left channel is usually outside the liver parenchyma. Fibrous tissue from the bottom of the common hepatic duct will be dissected. The hepatic stump will allow the Petersen method – introduction of a metal catheter into the duct.

The last step will ease to a maximum the exposure of the left channel. The anterior wall of the left duct will be incised – the incision starts from the junction up on the left channel. The maneuver will allow us to do a proper size anastomosis. We will resort to a lateral side stoma with ordinary sutures in a single layer. Typically this anastomosis requires intraluminal drainage for 6 months. Usually, Hepp-Couinaud technique allows an ideal mucosal confront and avoidance of anastomosis strictures at distance. During our research, this technique was used on a lot of 90 cases (44,3%).

From technical viewpoint, the most difficult cases, were type IV strictures – 15 cases (7.4%). The difficulties were increased by the postoperative cicatriceal process, by the lack of common bile duct and the involvement of junction of right and left hepatic duct in the scar. The applied technique allowed the individualization of hepatic pedicle, the identification and dissection of the hepatic artery to the hilum and section of the hilar plaque in order to indentify right and left hepatic ducts, and exploring CBD with the metal explorer.

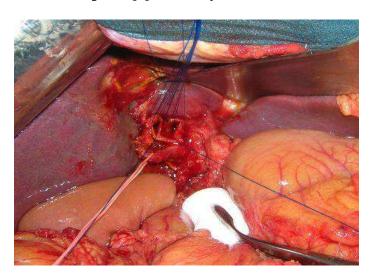


Figure 3. Double hepaticojejunostomy

Double hepaticojejunostomy with a Roux-en-Y excluded loop and mandatory transanastomotic drainage of both ducts according to Voelker, was performed. A basic principle for these anastomoses was the use of atraumatic PDS type suture 5/0 or 6/0 - in a single layer with a thorough appropriation of mucosal tissue and total exclusion of original sclerotic tissue (Figure 3).

## **Results**

Iatrogenic bile duct strictures are only histologically benign, otherwise they behave clinically as malignant diseases, presenting a tendency to progression, being severe through their general repercussions, and difficult to correct surgically, with a tendency to relapse, or developing severe postoperative complications. Therefore, we prefer the first reconstructive intervention to be radical, solving the stricture.

Immediate postoperative complications were occurred in 27 cases (13.3%). Some patients had general/local complications, like postoperative pneumonia, wound infection, persistence bile leak after 72 hours postoperatively. They were generated by the presence of cholangitis, transient mechanical jaundice and technical difficulties in forming a biliodigestive anastomosis. Most often, we noticed complications in patients who had severe lesions and suffered from biliary peritonitis. The presence of excess local fibrous tissue and persistent cholangitis facilitated a severe clinical course with immediate complications. All cases of postoperative complications were managed conservatively and did not require repeated surgery. Postoperative mortality at the reconstructive stage was absent as a result of preoperative preparation, the proper decompression of the biliary tree and intensive therapy performed both preoperatively and postoperatively with antibacterial, liver and volume correction.

Postoperative outcomes consisted of clinical, biochemical and ultrasound control after 1 month, 3 months, 6 months and annually thereafter for detecting possible signs of anastomotic malfunction. Where there were suspicions, complex investigations like CT or MRCP were performed. Some patients were followed up at the regional district or city hospital. The most effective method was the direct contact with each patient in Surgery Clinic no. 2.

The main monitored parameters were: biochemical indexes of cholestasis and hepatic cytolysis, sonography for the permeability of the biliary tree, MRCP scan and dynamic functionality

test assessed by sequential bilio-scintigraphy. Resort episodic confinement was signed to define the clinical status of the patient and clinical functional certification of the bilio-digestive derivations. Social rehabilitation of these patients, who underwent some series of interventions after the BL lesion, was of our interest.

Remote complications occurred in 29 cases (14.3%). They occurred at an average of 29.32±3.28 months from the reconstructive surgery with Statistical Deviation (DS) of 17.37. In all these cases, there was an episodic clinical picture of cholangitis associated with transient jaundice, episodes of biliary colic, shivers. The establishment of an algorithm for diagnosis and treatment allowed to find in a timely manner the direct cause of occurring complications and to demonstrate the link between the applied bilio-digestive derivations and biliary strictures settled in the past.

The most common were cases of stricture of hepaticojejuno-anastomosis, observed in 24 cases (11.8%). The clinical situation was explained by a severe fibroblastic process on the anastomotic mouth, which took its course with the clinical aspect of obstructive jaundice, purulent cholangitis episodes, liver and renal failure. There were 3 cases (1.5%) that developed gallstones associated with partial stricture of the HJA. For these patients, we used 3/0 silk as suture material and the anastomosis was carried out in difficult technical conditions. A patient had the biliodigestive anastomosis performed with a Roux-en-Y loop with one arm of less than 50 cm long. The patient remotely developed a major entero-biliary reflux, associated with a reflux cholangitis with episodes of transient jaundice, shivers, and sepsis. There was a case of mixed, vascular-biliary biliary lesion during the correction phase and adequate drainage covered through the collaterals of the concerned hepatic lobe. One year after the reconstruction, the patient suffered an episode of haemobilia with jaundice. He was emergency hospitalized in the clinic, where during instrumental examinations (MRCP and angio-CT) a stricture of anastomosis and pseudo-aneurysm of the branch of the right hepatic artery erupting in the biliary tree were identified.

All these patients required multiple reconstructive surgeries. The following desideratum was considered when deciding the surgical strategy: fluid correction through the crystalloid infusions, amino acids, fresh frozen plasma; correction of liver function; antibiotic therapy; surgery only after a proper correction of all vital indices. Analysis of imaging data is valuable, cholangiograms received through MRCP, and cholangio - CT.

For us, the surgeons, the priority was to determine preoperatively the length of the biliary tree above the anastomosis and the jejunal loop, the absence or presence of gallstones, complete or partial stricture and, most importantly, the extension of the stricture from the anastomosis on the biliary tree.

## **Discussions**

Iatrogenic strictures of main biliary ducts are characterized by a high degree of severity, with the tendency to a more proximal location, more frequently found in recent years. Most restorative and temporary drainage interventions on biliary ducts require a new biliary-digestive intervention (Sadiq, et al., 2012; Laura, et al., 2013; DeSantibanes, et al., 2008).

In surgery for benign biliary strictures, reconstruction of the biliary system through HJA has become a standard procedure. The anastomosis is performed through modern suture in a single layer mucosa-to-mucosa using a jejunal arm Roux-en-Y. It was proved to be safe and feasible, even in high reconstructions simultaneously applying on several bile ducts (DeSantibanes, et al., 2008; Hotineanu, Ferdohleb, et al., 2005; Nagino, et al., 2002).

When performing HJA, different types of sutures of bile stump are applied to the intestine. Particularly important is the distance of suture application, the depth and the type of the suture. In

current practice, the anastomosis is performed with ordinary sutures that are passed through all layers. PDS suture material, Vycril 4/0-5/0 are accepted. We focus on a good eremitism, using sutures with a 2-3 mm step. The posterior lip is performed with the nodes in the lumen, and the anterior one with the nodes outside. The suture line is strengthened with up to 5 anterior sero-serous sutures only when necessary (Pleass, et al., 1998; Satoshi, et al., 2012).

Regardless of the biliary stump level, the precise mucosa-to-mucosa suture in a single plan of discontinued sutures and the placement of transanastomotic drainage tubes ensured a sufficient anastomosis with bile flow or remote strictures. It is quite important during high anastomosis, on the hilum level to drain each bile duct separately. Long-term outcome of these cases was reported as being comparable to low hepatico-jejuno-anastomosis (Sadiq, et al., 2012; Winslow, et al. 2009; Satoshi, et al., 2012; José, et al., 2010).

Hepp-Couinaud technique relies on the left extrahepatic hepatic duct. Fascia incision concentrated around the hepatic artery, portal vein and represents the "hilarium plaque", which allows easy exposure of the extrahepatic left hepatic duct. The left hepatic duct is an excellent choice for repairing proximal strictures because it is located under 4th segment and makes an optimal access to the stoma. In addition, it has a rich blood supply that is not affected by iatrogenic lesions, unlike the fragile blood supply of the common hepatic duct.

Remote results of HJA on Roux- en-Y loop are reported as very good by the majority of publications in the field, with excellent results in 85% of cases.

At least 5 years after the reconstruction are considered an optimal period of postoperative evaluation of the results. A series of studies underlines that two-thirds of complications occur within 2 years, 80% within 5 years, while 20% of failures may occur 5 years after the operation. According to L.H. Blumgart, 40% of re-strictures were identified after more than five years since the reconstructive surgery. Therefore, monitoring during the first five years or more is necessary for evaluating the results. In choosing the critical length of time, the professionals should consider comparing the results from different series of treatments (Leslie, et al., 2012).

Large international experience in studying the quality of life (QoL) presents promising opportunities of this method for all branches of clinical medicine and can be used with traditional indicators for monitoring the effectiveness of surgical treatment. There is currently no data on the level of disability and postoperative rehabilitation after reconstructive surgery. Therefore, we consider it important to study the future quality of life of patients with iatrogenic lesions and scar biliary strictures. The effectiveness of biliodigestive anastomoses should be evaluated in the immediate postoperative period and in time. Research of QoL can help solving the problem of patients' rehabilitation and their return to normal life.

#### **Conclusions**

The diagnosis and management of benign biliary strictures remain a challenge. Given the risks of septic biliary complications, the costs and the high associated morbidity due to repeated surgeries, an accurate diagnosis is crucial. Factors such as the detailed knowledge of the patient's medical history or embracing a multidisciplinary approach in managing treatment objectives have an important contribution to a satisfactory and lasting outcome. (Singh, et al., 2015).

The definitive goal of surgical management is to restore bile flow in the proximal gastrointestinal tract that prevents any reflux cholangitis, re-strictures of the biliary tree and chronic hepatobiliary pain.

Choosing the appropriate reconstructive surgical method to address iatrogenic biliary strictures depends on their localization. For type I strictures, an end-to-side choledochojejunostomy

with a Roux-en-Y excluded loop is optimal. For the type II, the solution consists of a choledochojejunostomy with a Roux-en-Y single loop, and in the case of a high upper extension of the stricture, we proceeded to hepaticojejunostomy with a Roux-en-Y excluded loop. For type III stenosis, an end-to-side hepaticojejunostomy with a Roux-en-Y excluded loop and transanastomotic drainage of the right and left hepatic ducts is applied. For type IV, a double hepaticojejunostomy with a Roux-en-Y excluded loop and mandatory transanastomotic drainage of both ducts is preferred.

A unified method for remote assessment of patients with postoperative biliary stricture would make possible a good estimation of the occurring complications and quality of life (QoL). Curently, it is important to know and evaluate the impact of biliary strictures and reconstructive operations on the patient's health and rehabilitation based on biomedical, physiological and socioeconomic indices. Study of QoL, among the multitude of factors related to health, would allow a deeper analysis of multifactorial components of human health according to WHO criteria, namely the medical-physiological, psychological and social problems of the patient.

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# Comparative analysis of the anthropological characteristics of children from Vojvodina (Serbia) and Belarus

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#### **Abstract**

**Objectives.** Anthropological traits of a population offer an insight into nutritional and socioeconomic conditions of the region. The aim of the study was to compare anthropometric traits and body mass index in children from Vojvodina and Belarus.

**Material and methods.** The study is a part of a research project entitled "Variability of morphofunctional indicators in the population of Belarus and Vojvodina - The Republic of Serbia. The study was conducted in Vojvodina from 2001 to 2004 and in various areas of Belarus from 2005 to 2007. The total number of subjects in Vojvodina was 5874 (2879 boys and 2968 girls) and in Belarus 4406 (2268 boys and 2138 girls). All subjects were between 7 and 14 years of age. The survey included height, weight, chest circumference, and the body mass index (BMI kg/m²) in relation to the age and sex.

**Results.** The results demonstrate that children from Vojvodina have significantly higher height, weight and chest circumference in relation to Belarus children, with an exception of the height values of 12-year-old girls. The average BMI is significantly higher in both boys and girls from Vojvodina, except for 11-year-old girls. The most noticeable differences in the means of weight, chest circumference, and BMI are recorded in 13-year-old subjects of both sexes. As for the height, the greatest variations are observed in 14-year-old boys and 10-year-old girls.

**Conclusions.** The study points to differences in morphological characteristics, however, the study is cross-sectional and implies that the establishment of individual criteria for assessing the growth is necessary for future.

**Keywords:** anthropometric traits, body mass index, children, Vojvodina, Belarus

#### Introduction

Anthropometric traits provide insight into the growth, development, body constitution and health condition of a population. During their development, in the period of ontogenesis, both genetic and environmental factors have an influence on the traits. Environmental factors can speed up or slow down the growth and development of certain traits, especially at young age.

As living conditions vary, both temporally and spatially, every region is characterized by a specific anthropological status. Anthropological status of a population offers an insight into the

nutritional and socio-economic conditions of a region. Some investigations emphasize the importance of assessing the dietary habits of the population, especially those of children and youth (Albu and Hodorca, 2014), because at this age healthy lifestyle knowledge has great chances to be established as an ally for the entire life (Zugravu, Rada and Nitu, 2009). Bad-living habits contribute to increasing the percentage of overweight children and require that parents and children should be better informed about the effects of an unhealthy diet on children's development (Baciu, 2011).

The study of variability in morpho-functional characteristics of the populations of Vojvodina (Serbia) and Belarus is a part of a mutual project with colleagues from Belarus. Vojvodina and Belarus have been characterized by different processes of economic development and changes in living conditions during the last few decades. The growth and development of basic anthropometric traits in children and adolescents have been studied by a number of authors in Serbia (Gavrilović, 1972; Gavrilović et al. 1987; Božić-Krstić, 1986; Božić-Krstić, Pavlica and Rakić, 2004; Pavlović, 1999; Rakić, Božić-Krstić and Pavlica, 2004; Rakić, Božić-Krstić and Pavlica, 2011) and Belarus (Тегако и сар. 2008a; Tegako, Marfina and Hurbo, 2008b; Tegako and Marfina, 2008c; Marfina, 2015).

As the variability in children and adolescents' growth reflects differences in the quality of their surroundings, anthropological results processed comparatively for different populations of the same age category can explain the influence of certain factors on the dynamics of growth and development in children. Comparative regional studies on the physical growth of children and adolescents can detect variability in the period of growth.

Regarding everything stated above, the aim of the present study was to compare anthropometric traits and body mass index in children from Vojvodina and Belarus.

#### Material and methods

A cross-sectional anthropometric study was conducted in Vojvodina from 2001 to 2004 and in various areas of Belarus from 2005 to 2007. The total number of subjects in Vojvodina was 5874 (2879 boys and 2968 girls) and in Belarus 4406 (2268 boys and 2138 girls). All subjects were between 7 and 14 years of age and for the purpose of this study their decimal age (based on the date of investigation and birth date) was calculated.

The anthropometric study was performed in compliance with the International Biological Programme and included three traits: stature/height (cm), weight (kg) and mid-chest circumference (cm). The stature measurements were performed using the Martin anthropometer, to the nearest 0.1 cm, the weight was measured on an electronic digital scale with an accuracy of up to 0.1 kg and the mid-chest circumference measures were obtained using the steel tape to the nearest 0.1 cm. The body mass index (BMI) was derived from the weight (kg) and height (m²) ratio.

Statistical data processing was completed by IBM SPSS 20 Statistics and the results are presented as means and standard deviation (SD) values. The Student t-test was applied for determining the differences in the traits and BMI values recorded in two investigations and the BMI percentiles ( $3^{rd}$ ,  $10^{th}$ ,  $25^{th}$ ,  $50^{th}$ ,  $75^{th}$ ,  $90^{th}$  and  $97^{th}$ ) were obtained. In all analyses, the statistical significance was set at p<0.05.

#### **Results**

Table 1 shows basic statistical parameters of the stature in relation to the gender and age of children from Vojvodina and Belarus.

		Vojvodin	a		Belarus				
	N	Mean	SD	N	Mean	SD	t-test	p	Difference
Boys									
7	313	126.17	6.11	359	123.95	5.85	4.785	**	2.22
8	380	130.94	6.68	327	129.48	5.85	3.091	**	1.46
9	366	136.18	6.58	192	134.00	6.91	3.601	**	2.18
10	349	140.33	6.94	218	138.85	5.86	2.716	**	1.48
11	369	147.31	7.23	125	145.07	7.35	2.963	**	2.24
12	355	153.04	8.10	290	150.09	7.23	4.887	**	2.95
13	359	160.53	8.80	471	156.77	8.71	6.121	**	3.76
14	388	167.20	8.72	286	163.09	8.94	5.968	**	4.11
Girls									
7	320	124.82	6.01	329	123.31	5.85	3.244	**	1.51
8	395	129.81	5.89	190	128.53	6.04	2.420	**	1.28
9	343	135.41	6.64	202	133.36	6.21	3.620	**	2.05
10	362	141.81	6.92	199	139.13	6.76	4.447	**	2.68
11	387	147.74	7.60	130	145.67	7.49	2.710	**	2.07
12	387	153.74	7.52	305	152.67	7.18	1.905	ns	1.07
13	402	159.68	6.34	498	157.44	6.95	5.045	**	2.24
14	372	162.49	6.33	285	160.92	6.29	3.172	**	1.57

It can be observed (Table 1) that stature generally increases with age in both boys and girls. Greater variability is detected in 11-year-old boys and girls aged 11 and 12 years, in both Vojvodina and Belarus subjects. Except for 12-year-old girls, the children from Vojvodina show significantly higher stature values than Belarussian boys and girls. In boys, the difference in stature increases with age, starting at the age of 10, and reaches the maximum at the age of 14 (4.11cm). In girls, the greatest difference is observable at the age of 10 (2.68cm).

Table 2 shows in parallel the weight mean values of boys and girls coming from Vojvodina and Belarus.

Table 2.	The weig	ght means (	kg) in chi	ldren fı	rom Vo	jvodina	and Be	larus		
		Vojvodin	a			Belarus				
	N	Mean	SD		N	Mean	SD	t-test	p	Difference
Boys										
7	313	27.92	5.69		359	24.93	3.98	7.775	**	2.99
8	380	30.31	6.72		327	27.83	5.03	5.598	**	2.48
9	366	33.70	8.02		191	30.79	5.42	5.072	**	2.91
10	349	36.44	8.25		218	33.99	7.01	3.776	**	2.45
11	369	42.02	11.56		125	38.66	8.66	3.424	**	3.36
12	355	46.69	11.01		291	41.31	8.09	7.152	**	5.38
13	359	52.39	11.43		470	45.55	9.49	9.184	**	6.84

14	388	58.43	11.92	284	51.85	11.44	7.235	**	6.58
Girls									
7	320	26.57	5.04	328	24.42	4.31	5.840	**	2.15
8	395	29.14	5.56	190	26.53	4.60	5.997	**	2.61
9	343	32.97	7.20	203	29.47	6.55	5.814	**	3.50
10	362	36.82	8.41	199	32.65	6.71	6.421	**	4.17
11	387	40.62	9.60	131	38.10	10.04	2.515	*	2.52
12	387	46.28	10.45	305	42.16	9.01	5.568	**	4.12
13	402	52.39	10.94	498	46.64	9.62	8.267	**	5.75
14	372	55.69	10.13	285	50.67	8.98	6.716	**	5.02
*p<0.05;	; **p<0.01		•	-					

The analysis of the results presented in the table above points to an increase in weight in boys and girls coming from both Vojvodina and Belarus. A noticeable variability in weight values is particularly observed in children older than 11 years, in both Vojvodina and Belarus. Children from Vojvodina show significantly higher weight values in relation to the children of the same age living in Belarus. The greatest difference is recorded in children aged 13 and 14.

The basic statistical parameters of mid-chest circumference in relation to the gender, age and area of residence are presented in Table 3.

		Vojvodin	a		Belarus				
	N	Mean	SD	N	Mean	SD	t-test	p	Difference
Boys									
7	313	63.74	5.32	346	60.42	3.44	9.391	**	3.32
8	380	65.53	5.66	290	61.65	3.98	10.420	**	3.88
9	366	68.11	6.89	157	64.39	4.54	7.286	**	3.72
10	349	70.11	6.89	184	67.14	6.20	5.066	**	2.97
11	369	73.80	8.46	119	70.36	7.23	4.325	**	3.44
12	355	76.40	7.94	272	72.28	6.54	7.127	**	4.12
13	359	79.66	8.15	452	73.73	6.44	11.266	**	5.93
14	388	83.52	7.74	272	78.46	8.36	7.890	**	5.06
Girls									
7	320	62.33	5.09	311	59.69	4.06	7.209	**	2.64
8	395	63.98	5.36	153	61.22	4.91	5.748	**	2.76
9	343	67.13	6.56	168	62.78	5.18	8.146	**	4.35
10	362	69.87	6.97	179	65.77	6.23	6.926	**	4.10
11	387	72.59	7.41	120	70.44	8.14	2.575	*	2.15
12	387	76.71	7.75	279	74.58	8.34	3.356	**	2.13
13	402	81.01	7.42	465	76.22	7.05	9.702	**	4.79
14	372	83.34	5.80	259	81.65	6.45	3.366	**	1.69

The results in Table 3 show that the mid-chest circumference values increase with age in children from both countries. A greater variability is observed for the ages of 11-14 in boys and for the ages of 11-13 in girls, in both investigations. Children from Vojvodina show significantly higher values of mid-chest circumference, with the greatest difference appearing in 13-year-old boys and girls (5.93cm and 4.79 cm, respectively).

The means of BMI are given in Table 4.

	7	Vojvodina <i>–</i>			Belarus	}			
	N	Mean	SD	N	Mean	SD	t-test	p	Differences
Boys									
7	313	17.44	2.59	359	16.16	1.72	7.449	**	1.28
8	380	17.54	2.79	327	16.51	2.11	5.592	**	1.03
9	366	18.01	3.18	191	17.06	2.31	4.036	**	0.95
10	349	18.35	3.09	218	17.52	2.68	3.400	**	0.83
11	369	19.16	3.92	125	18.21	2.78	2.939	**	0.95
12	355	19.78	3.60	290	18.23	2.58	6.338	**	1.55
13	359	20.18	3.28	470	18.38	2.53	8.623	**	1.80
14	388	20.77	3.24	284	19.31	2.99	6.041	**	1.46
Girls									
7	320	16.94	2.25	328	15.96	1.86	6.057	**	0.98
8	395	17.20	2.50	190	15.99	2.09	6.156	**	1.21
9	343	17.85	2.90	202	16.47	2.52	5.838	**	1.38
10	362	18.16	3.06	199	16.77	2.50	5.810	**	1.39
11	387	18.45	3.29	130	17.83	3.63	1.723	ns	0.62
12	387	19.45	3.48	305	17.95	2.85	6.224	**	1.50
13	402	20.47	3.72	498	18.71	3.11	7.576	**	1.76
14	372	21.04	3.36	284	19.51	2.94	6.215	**	1.53

As it is seen in Table 4, boys and girls from Vojvodina have significantly higher BMI values in all the age groups, except for the 11-year-old girls (Table 4).

The percentile values of BMI obtained for boys and girls coming from the two countries are presented in Table 5.

	Table 5. Distribution of percentile values of BMI (kg/m²) in relation to the gender and age of children from Vojvodina and Belarus														
			V	ojvodi	na						I	Belaru	S		
	3	10	25	50	75	90	97		3	10	25	50	75	90	97
Boys															
7	14.3	14.8	15.7	17.0	18.6	21.0	24.0		13.8	14.4	15.0	15.8	17.1	18.2	20.5

8	14.2	14.8	15.8	16.8	18.7	21.1	24.3	13.6	14.2	15.2	16.2	17.4	19.7	21.6
9	14.1	14.9	15.8	17.3	19.2	22.6	26.5	14.0	14.8	15.7	16.6	18.0	20	21.7
10	14.7	15.3	16.0	17.5	20.1	22.9	24.9	14.6	15.1	15.8	16.8	18.5	20.8	24.0
11	14.9	15.3	16.5	18.2	20.9	24.2	28.2	14.8	15.6	16.2	17.6	19.2	22.4	24.8
12	15.1	15.9	17.2	18.9	21.8	25.0	28.2	14.9	15.6	16.4	17.8	19.5	21.6	24.1
13	15.4	16.8	17.9	19.4	22.0	24.4	27.9	14.9	15.8	16.7	18.0	19.4	21.7	23.9
14	16.1	17.2	18.6	20.2	22.4	25.2	28.8	15.4	16.4	17.4	18.7	20.5	23.1	27.3
Girls														
7	13.6	14.5	15.3	16.6	17.9	20.3	22.4	13.4	14.2	14.7	15.6	16.9	18.4	20.6
8	13.8	14.6	15.4	16.7	18.3	20.6	23.6	13.2	13.8	14.6	15.7	16.8	18.5	21.5
9	14.0	14.9	15.7	17.2	19.3	22.0	25.1	13.4	14	14.8	15.9	17.7	19.4	22.2
10	14.2	15.0	15.9	17.6	19.6	22.5	25.7	13.6	14.3	15.1	16.1	17.8	19.9	23.2
11	14.5	15.2	16.2	17.7	19.7	23.4	26.2	14.3	14.8	15.6	17.0	18.8	21.2	24.4
12	14.9	16.0	17.0	18.5	21.1	24.3	27.9	14.2	15.0	16.1	17.3	19.2	21.1	24.6
13	15.4	16.4	17.9	19.7	22.3	25.8	29.2	14.5	15.4	16.6	18.3	20.2	22.8	25.7
14	16.3	17.5	18.7	20.6	22.8	24.8	29.3	15.2	16.3	17.6	19.1	21.2	23.2	25.6

According to the distribution of BMI percentiles in relation to the gender and age, higher values are observed in subjects of all ages coming from Vojvodina (Table 5).

The value of 50<sup>th</sup> percentile in 14-year-old boys from Vojvodina equals 20.2 kg/m<sup>2</sup> and in Belarussian boys it is 18.7 kg/m<sup>2</sup>, making thus the difference of 1.5 kg/m<sup>2</sup>. In girls, the difference is 1.4 kg/m<sup>2</sup> (20.6 and 19.1 kg/m<sup>2</sup> in Vojvodina and Belarus, respectively).

#### **Discussion**

The paper presents a comparative analysis of some anthropometric traits of children from Vojvodina and Belarus, focusing on the major anthropometric traits for assessing the body size of an individual or a population. The results suggest that the children from Vojvodina are characterized by higher values of stature (except for the 12-year-old girls), weight, mid-chest circumference and body mass index (with the exception of the 11-year-old girls) in comparison with Belarussian children. The differences can be explained by different genetic and environmental factors, including socioeconomic conditions, lifestyle, the degree of physical activity and nutritional habits.

Comparing the obtained results of stature, weight and body mass index with relevant literature data, the children in this study show greater values of the three traits in relation to children from Bahrain (Gharib and Rasheed, 2009) and from Arak-Central Iran (Bayat et al. 2012), but lower than the values reported for children from Cyprus (Savvas et al. 2001). In comparison with children from Bucharest (Radu et al. 2006-2007), Belarussian boys and girls have lower means of stature, weight, and body mass index.

In relation to the data obtained in Western Romania (Emandi et al. 2012), Belarussian boys and girls are characterized by lower stature and weight, and the same is noticed for certain ages groups among children from Vojvodina. The results of this study also suggest that boys and girls from Vojvodina and Belarus show greater stature and weight in comparison with Polish (Niewiadomska et al. 2011) and Turkish (Oner et al. 2004) children, with the exception of the 12-year-old Belarussian girls in the latter case.

As a result of entering the period of puberty, the girls analyzed in this study appear to be taller than boys at the ages of 10, 11 and 12, this phenomenon being observed in both countries. The greatest annual increase in boys' stature is noticed at the age of 13, in both Vojvodina and Belarus, which is in line with the data found in the literature (Božić-Krstić, 1986; Emandi et al. 2012). The absolute annual increase of weight and mid-chest circumference is greatest among 14-year-old boys from both Vojvodina and Belarus, while in girls, this is observed at earlier ages.

The data referring to BMI indicates that the values recorded for boys aged 7-9 and girls aged 7-10 in this study are smaller than those reported for children in Greece (Tzotzas et al. 2011). In addition, the 50<sup>th</sup> percentile of the oldest boys in this study (14 years of age) appears to be lower than in the case of boys from Cyprus (Savvas et al. 2001), Bucharest (Radu et al. 2006-2007) and Western Romania (Emandi et al. 2012).

#### Conclusion

The boys from Vojvodina, in all the age groups, have higher values for the observed parameters compared to their peers in Belarus. For girls, the same can be generally concluded, except for stature of 12-year-old girls and likewise for weight, mid-chest circumference and BMI of 11-year-old girls.

These differences between subjects from Vojvodina and Belarus can be explained by genetic factors, but also various exogenous factors that influence the growth and development of children in the two observed populations.

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## The role of the family in the psychiatric treatment dropout

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#### **Abstract**

**Objectives.** The aims of our study were to classify the reasons for psychiatric treatment dropout. **Materials and methods.** 300 patients diagnosed with schizophrenia and bipolar I disorders who had discontinued psychiatric treatment were questioned about the reasons for discontinuation during 2014. Reasons included the report of the patient and conclusions drawn by the psychiatrists based on the whole context of the patient's life and family reports. The study sample included only patients with at least two hospital admissions, in order to make sure they had some experience with psychiatric disorders, psychiatric treatment and were under specialized treatment, thus a confirmed diagnosis.

**Results.** The first reason of dropout is reported as follows: 36.6% of dropout results due to lack of insight; 31.7% due to side effects; 8.4% for economic reasons; 23.3% after significant improvement of the symptoms. 79% of subjects revealed that the second reason is related to family care and support. This derives from two main causes: 42% because of continuous poor family support, related to the socioeconomic status, and 37% due to decrease in family support, mainly as a result of parents' loss or aging, or emigration of siblings.

**Conclusions.** Dropout of psychiatric treatment brings a lot of challenges for the mental health system. Many of the factors are changeable. Dropout factors vary from disorder-related to social-related issues. Primary reasons are related to the disorders and medication; family-related causes seem to be very important factors that influence dropout from psychiatric treatment. Professional workers and family care should be better oriented for an overall better mental health care.

Keywords: treatment dropout, family support, hospital admission, socioeconomic status.

#### Introduction

Medical treatment adherence, as an important element for a successful therapeutical management, especially for chronic conditions is studied and discussed for all medical specialties. It has also economic implications directly related to poor health and decreased performance (Osterberg and Blaschke, 2005). In addition, we should be careful to avoid errors of adherence. Errors in drug adherence may be categorized into four groups: errors of omission, errors of purpose (taking medicine for the wrong reasons), errors of dosage, and mistakes in timing or sequence. There is another group of patients who takes additional medications not prescribed by the physician, which may be potentially dangerous (Blackwell 1976). Psychiatric patients are considered to be the highest non-adherent patients because of stigma and cognitive changes. Psychiatrists may also provide more expertise in other fields of medicine about this issue. There are two direct reasons why psychiatrists need to concern themselves with the problems of adherence. The first is the implication it has for personal practice; another is to provide expert consultation to other health professionals on the

management of adherence in general medical practice. Two of the important contributions of psychiatry to the rest of medicine may be a better understanding of the extent to which treatment is specific and of the degree to which treatment can be implemented (Blackwell, 1976). These conclusions, made about forty years ago, are still relevant. Further studies have implied much more implications. This includes also socioeconomic reasons. One of the non-adherence models is drug treatment dropout (Blackwell, 1976). There are many risk factors for dropout. The behavioral model of access to health care offers a framework for organizing findings on predictors of dropout. Dropout risk can be viewed as a joint function of predisposing demographic factors (gender and age), social factors (marital status and education), enabling factors (health insurance, income, and number of providers), and needs (psychiatric disorder, co-morbidities, and past treatment) (Olfson et al., 2009).

With reference to the specifics of Albania, we believe that many of the latest changes and reforms have affected mental health system and the mentality about mental health may not be quite coherent with these changes. There has been a debate between those who favor providing mental health treatment and care in hospitals, and those who prefer providing it in community settings, primarily or even exclusively. A third alternative is to utilize both community services and hospital care. In this balanced care model, the focus is on providing services in normal community settings close to the population served, while hospital stays are as brief as possible, promptly arranged and used only when necessary. This balanced interpretation of community-based services goes beyond the rhetoric about whether hospital care or community care is better and instead encourages consideration of what blend of approaches is best suited to a particular area at a particular time. Primary care staff will probably need to provide most if not all of the mental health services in primary health care settings, with specialist backup to provide training, consultation, inpatient assessment and treatment that cannot be provided in primary care. Some low-resource countries may, in fact, be in a pre-asylum stage, in which the apparent community care, in fact, represents widespread neglect of the mentally ill (Thornicroft and Tansella, 2003). The major recent change in mental health care system in Albania is the development of community mental health care. This strategy, which has been introduced since the early 2000s, started to be implemented later. Considering the difficulties of a country in development, it has not been fully put into effect. The first rapid developments have been followed by a plateau phase in the implementation. Logistic, financial and human resources factors contribute to this deceleration. This situation has influenced the treatment of mentally ill patients, as the follow-up of a patient in the community is important for the medical treatment and social inclusion with direct consequences on the overall functioning of mental health patients. However, this process will continue and mental health services will provide better care for the patients. Key issues of the strategy to provide better care include further development of psychosocial services and performance indicators for mental health services (Ministry of Health Albania, 2013). On the other hand, if community services are not quite developed or lack adequate human and logistic resources, the role of the family in supporting mental health patients with or without function decreases. Primary care system also offers only rudimentary mental health care and is not contributing quite enough for the treatment.

In this context, it is very important to explain the mentality of Albanian society related to family connections. Traditionally, the Albanian family has been the primary source of support for its members. This support includes patient support and in the case of a psychiatric patient, it has a greater role because of the lack of insight of a psychiatric patient compared to a patient with a medical condition. This approach has increased the total burden of care for the families (Leggatt, 2002). Traditionally, large psychiatric hospitals have been shelters for a wide range of mentally ill patients (Leggatt, 2002). This approach has ensured the drug treatment of these patients, but it has

not offered multidisciplinary treatment, which may also help psychiatric patients to preserve skills and to develop new ones. Community care intends toward a multidisciplinary approach for the mentally ill persons and also for the inclusion of these patients in the society, but Albania suffers from insufficiency of human resources and population coverage (WHO Aims Report, 2006), thus family burden is increased and family care has to take a greater role in the management of patients. The rate of hospitalization decreased initially, but it started to increase again, due to increased family burden. This results in loss of energy and leads to poor adherence and dropout of psychiatric treatment, which seems to be an important factor for the increase of hospitalization rate and the overall quality of life for the mentally ill patients (Tehrani et al., 1996; Masaki et al., 1997; Furegato, Castro and Santos, 2011). In the Albanian context, the family has a crucial role in the management of patients. There are also strong relations with the role of family care, psychiatric treatment dropout, psychiatric hospitalizations and quality of life of the patients (Furegato, Castro and Santos 2011; Baekeland and Lundwall, 1975; Chen, 1991).

#### Materials and methods

This is an observational study with descriptive components. The study included 300 patients who came for consultation in the hospital's psychiatric service in Tirana, Albania, during 2014. Subjects were patients suffering from schizophrenia and bipolar I disorder diagnosed according to DSM-IV-TR criteria, and having discontinued the treatment. At least two hospital admissions were among the selection standards to meet, in order to make sure that the patients have some experience with psychiatric disorders, psychiatric treatment and were under specialized treatment, thus a confirmed diagnosis. Another requirement was that patients should respond directly about treatment discontinuation, so the physician could have sufficient information about the life and treatment context in order to draw proper conclusions. The study also included patients who were consulted directly because of a relapse of symptoms and whose treatment was discontinued against medical advice. Patients that have not answered clearly about the reason for discontinuation and without adequate information about life context have been excluded.

To the patients' group have been posed direct questions about the cause of treatment discontinuation, and the answer has been given directly by each patient. This answer has been considered as the first reason for treatment dropout. The responses were grouped into the following categories: "I do not have money to buy medicines" - economic reasons, "I am not ill" - lack of insight, "I am very well now, why to take medicines" - improvement of symptoms (in this case we have been careful to clarify improvement of symptoms with lack of insight), "since I have taken this medicine, I have some new problems" - side effects (which have been also evaluated as side effects by the examining psychiatrist).

A group of questions about family and life context has been directed to the patient, family members, and/or accompanying person. Also, conclusions from referral documents have been carefully examined in order to have a clear picture of family involvement in the care of patients, for example: Do you take your medication yourself or someone other gives it to you? Answer: "My sister comes to my home every day and gives it to me", or: "Why after many years of maintained treatment the patient has discontinued it in this proper moment?" Answer: "Till now the mother of the patient has given the medicines rigorously, but she passed away three months ago". This group of questions also obtained data about the socioeconomic status of the patient and the family. Considering the fact that there is not an adopted scale of measuring the socioeconomic status in the country, even with its limitations, we have "classified" all family socioeconomic situations in three groups related to monthly family income: low level, <200 euro (146 subjects), medium level, 200-

700 euro, (96 subjects) and high level, > 700 euro monthly family income (58 subjects). Another classification is related to rural and urban inhabitants.

#### **Results**

The results were classified into two major categories of reasons. The first is related to direct reasons of dropout medication without taking into consideration the context of the patient's life. Beyond the direct reasons for discontinuation, evaluation of the context of the patient's life results in the direct implication of the family as an important factor for the dropout of psychiatric treatment. The vast majority of cases revealed that the second reason for the first three groups (79% of all respondents) is related to family care and support (Table 1).

**Table 1. Results of dropout reasons** 

Reasons of dropout	Second 1	eason	Lack of t	•	Decreas fami suppo	ly	Medi reaso		Othe	er
First reason	Tota	al	42.0%	126	37.0%	111	11.0%	33	10.0%	30
Lack of insight	36.6%	110	17.0%	51	13.0%	39	1.7%	5	5.0%	15
Side effects	31.7%	95	14.0%	42	11.6%	35	3.7%	11	2.4%	7
Improvement of symptoms	23.3%	70	8.7%	26	9.7%	29	5.0%	15	0.0%	0
Economic reasons	8.4%	25	2.3%	7	2.7%	8	0.6%	2	2.6%	8

Poor or discontinuous family support is reflected as the involvement of family members in the distress that a particular patient produces to them. Usually, as reported, family members get involved only if the patient affects their lives directly (e.g.: aggressive behavior inside or outside the home). In most of the cases, the family members are satisfied if the patients do not pose risk to them. The lower socioeconomic level of family members resulted in higher dropout rates and nearly half of all subjects (48.6%) are in this group, while medium socioeconomic group includes 32% of all subjects. On the other hand, the higher socioeconomic level group (19.3%) has the lowest number of subjects, consequently reflecting a better level of support. Also, rural area inhabitants show a poor level of support (59%). In this last case, stigma, lifestyle and education level are also some of the components that hinder social inclusion of patients. All these factors imply that socioeconomic status of the patient and his family has an important effect in treatment dropout (Table 2).

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Socioeconomic relations	Income		Lo	w	Medi	um	High		
	Tot	Total		146	32.0%	96	19.3%	58	
Rural	59%	177	34.0%	102	18.0%	54	7.0%	21	
Urban	41%	123	14.6%	44	14.0%	42	12.0%	37	

Table 2. Socioeconomic relations

Another observation is that many of the patients with good support in their personal history, as reported by caregivers or referral documents (37%), have a decrease in family support as a result of a new family situation. For a considerable percentage of patients (30%), the challenge is represented by a parent's loss, while for a smaller ratio (13.5%) by aging of the parents, who cannot longer provide the same level of care. The rest of this group (56.5%) has had support from their siblings, whose emigration has resulted in decreased support for these patients.

#### **Discussion**

The above-mentioned observational data with simple descriptive evaluation make us aware of the limitations of this study. The resulted data show that factors influencing psychiatric treatment dropout range from purely psychiatric to purely social, as well as overlaps between them (Osterberg and Blaschke, 2005). On the other hand, literature and studies in other countries sometimes provide different conclusions and also contradictory conclusions about dropout rates and predictors (Ribeiro et al., 2012), which may also indicate that in different cultures and conditions the evaluation of a situation should probably be started from different assumptions (Reneses et al., 2009). Data for this evaluation have been gathered only in one hospital. Other studies point out hat even in welldesigned studies national surveys should be performed for more comprehensive data and results (Olfson et al., 2009). There are studies that report a higher number of dropouts in lower socioeconomic level patients (Bruwer et al., 2011), and also studies that reveal a higher percentage of dropouts related to the lower socioeconomic status of their families (Pelkonen et al., 2000). Similar findings related to the impact of the socioeconomic level were obtained within the current study. Considering the outcomes of treatment dropout especially in the group of patients suffering from psychotic disorders, it is very important to raise the awareness of psychiatrists and to work and educate family members of patients to detect early signs of treatment dropout (Hui et al., 2000). Considering the fact that lack of insight is the most frequent factor in our observation compared to international data, this seems to be somewhat higher than other countries. This situation may be explained by the heavy workload of the psychiatrists in Albania and rudimentary multidisciplinary approach.

However, this is the first attempt to evaluate dropout factors and the relation with the family support in Albania. As literature indicates, there are many overlaps between various locations about the same issues related to dropout of treatment, also there are some local factors especially related to the family connections and to the specific situation in Albania. As previously mentioned, these specificities concern the rudimentary support within primary care facilities for mental health services and the shortage of community mental health care. In this context, this evaluation assessment serves as a cornerstone for further well-designed studies with stronger conclusions.

#### **Conclusions**

Dropout of psychiatric treatment brings a lot of challenges for the mental health system. Factors influencing the phenomena derive from many parts of the care system for the mental illnesses. Many of the classified reasons are highly probable to be changed. Lack of insight, especially for the studied disorders, is directly related to the work of the multidisciplinary staff within the mental health system. In addition focusing on side effects and choosing drugs with the fewest side effects possible or lowering side effects by using the lowest appropriate dose prescribed by the physicians will help patients to continue effective treatment. Family support, even if not in the first sight of the problem, is present in one form or another in the majority of cases. In this context, demographic changes should be foreseen as accurately as possible in order to take the necessary measures to ease the social and economic burden. Albanian family has still a great solidarity, but there are also other reasons that go beyond. As reported, aging of the parents of the mentally ill patients has started to produce effects in the care and quality of life for the patients, so measures to replace the support of parents should be taken by the social services. Also, emigration has given its consequences with decreasing the level of care. The socioeconomic status has its implications and this point should be taken into consideration when evaluating the total cost of mental health disability. Finally, this attempt should be followed by other studies with the support of government organizations, including costs evaluation for medicines and social support.

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## The specificity of developing and implementing different models of occupational health services

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#### **Abstract**

**Objectives.** We performed the analytical study of occupational health services system implementation's specificity and highlighted the particularities of different occupational health services in European countries caused by decentralization, short-term hiring, high mobility of human resources, implementation of new technologies and work processes.

Organization and performance of the system of occupational health services have become a difficult assignment because of the decentralized national economy, short-term employment contracts, the high mobility of human resources, implementation of new technologies and new working methods.

**Material and methods.** This work is the result of organized research and meta-analysis of 31 systematic reviews provided with the logistical support of the World Health Organization, the International Labour Organization, Council of Europe, Institute of Occupational Health in Finland and other international organizations; it is important to mention that none of them explicitly defined the management problem and Occupational Health Services model for the Eastern Europe & post-Soviet regions, between 1998 and 2014.

Results. The basic occupational health services' system (BOHS) is essential in protecting people's health at their workplaces, their wealth, and work capacity, as well as in preventing work accidents. BOHS should be approachable for any employee fair, efficient, cost-effective, and guaranteed by the public authorities. ILO/WHO started to shape Global Public health policy by launching the "Health for All" strategy in 1977. This strategy spelled out the key target for a global health policy for the rest of the 20th century as follows: "by the year 2000 all people in all countries should have a level of health that will permit them to lead a socially and economically productive life". In 2003-2005, the Committee on Occupational Safety and Health of ILO called for the development of Occupational Health Services as part of the National Program for Occupational Safety and Health, emphasizing that the development of occupational health services is a component of the National Occupational Safety and Health System. Likewise, the BOHS was recognized as a step towards implementing ILO Conventions no 161 (1985) and the new ILO Global Strategy on Safety and Health at Work, which were adopted by the 92<sup>nd</sup> ILO conference in 2004.

**Conclusions.** Training human resources in the field, producing professionals, is the fundamental condition for ensuring quality and performance of this service. In addition, WHO/ILO have developed different occupational health services models depending on the health systems.

**Keywords:** Basic Occupational Health Services; International Labour Organization; World Health Organization; Convention no. 161 (1985).

#### Introduction

According to WHO, from a total of about 130 million employees working in Europe, only 50% are covered by Occupational Health Services (OHS), which means that about 65 million do not have access to the OHS (Rantanen, 1999). The coverage of these services varies from 25% to 95% among the workforce in different countries. It should be said that only official employees enter the statistics, whereas freelancers and housewives are not included. Considering this, the unofficial coverage level is even lower. In the globalizing world, the development of occupational health services has not been all that impressive covering only 15% of the worldwide workforce. The workers most in need in small-scale enterprises, micro enterprises, agriculture and informal sector do not have access to occupational health services. The objective of Occupational Health for All set in the WHO Global Strategy on Occupational Health in 1995 has not got much closer in the past 15 years (Rantanen, 2009).

There were adopted numerous directives related to occupational safety and health, working conditions and other documents about employees' social safety in the last 50 years in Europe.

Occupational health services (OHS) concept was built and developed through globalization of the work market. OHS strategy includes maintaining a healthy and safe working environment, protecting health and preservation of working capacity and active participation of employees and managers in the process of developing workplaces.

International Labor Organization (ILO) Convention no. 161 from 1985 and its recommendations no. 171 are essential instruments in developing and organization of basic occupational health services (BOHS) for employees from different branches of national economy.

ILO's conventions and European Commission's directives provide a comprehensive approach to preventing occupational diseases and promoting equity and accessibility of the services. However, these documents allow the existence of different BOHS systems and models.

#### Materials and methods

This work is the result of organized research and meta-analysis of 31 systematic reviews published between 1998 and 2014, with the logistical support of the World Health Organization, the International Labour Organization, Council of Europe, Institute of Occupational Health in Finland and other international organizations. The bibliographical and case study methods were used to collect and analyze information from reports and official documentation of the National Centre for Public Health, along with literature in the field from European countries over the 1998-2014 period.

This meta-analysis work was based on "Survey of the Quality and Effectiveness of Occupational Health Services in the European Union and Norway and Switzerland" funded by SALTSA (The Joint Programmer for Working Life Research in Europe) and organized as a collaborative effort between the National Institute for Working Life (NIWL) of Sweden and the Finnish Institute of Occupational Health (FIOH). The project was organized by the Research and Development Centre for Occupational Health Services so that it had a project group in Helsinki and Kuopio, Finland, 2001 year (FIOH, 2011).

This survey was of particular interest to us as it had experts from the participating countries, and representatives of ILO, WHO/Euro, and the European Agency for Safety and Health at Work (Bilbao), and the European Trade Union Confederation assigned.

The main objectives of the survey were to determine what indicators were used to measure the impact of OHS in 17 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden,

Switzerland and the United Kingdom). Persons were appointed from different countries to act as national collaborators for the survey. These persons supported and organized interviews and offered their insight and views about OHS and quality management in their respective countries. Most of them were from research institutes, universities and professional organizations already experienced in OHS research.

OHS units received a questionnaire with mostly open-ended questions. Depending on the country, the questionnaire was translated into the local language by the national collaborator and sent to pre-selected persons in OHS units by e-mail or mail. The interviewer also met 50% of all OHS unit representatives to clarify and confirm certain questions and answers during a visit made to each country.

The structured interviews and questionnaire consisted of questions on different aspects of OHS, for example, legislation, OHS and quality management policy, stakeholders, monitoring, inspection and evaluation of OHS, financing of OHS, integration of OHS, planning and implementation of OHS and quality management, promotion of OHS and quality management, indicators of effectiveness, efficiency, training, and multidisciplinary functions.

Obviously, for the Republic of Moldova, it is appropriate to compare the development of occupational health services with the countries of Eastern Europe and the post-Soviet States. This paper may present arguments for organizing a study for Moldova's neighboring countries: Romania, Hungary, Slovenia, Slovakia, Czech Republic, Bulgaria, and Ukraine.

#### **Results**

In this article, the discussions will target the implementation and development of ILO Convention no. 161 (1985) concerning basic occupational health services among European countries. The BOHS assignments and obligations are employers, employees and their assignee guidance in maintaining a healthy environment that facilitates mental and physical health in relation to work, guidance in workplace accommodation to the worker. BOHS convention stresses the importance of multidisciplinary and multispectral collaboration (ILO, 1985).

The multispectral approach of the concept "occupational health" enquires policy expansion and implementation on all levels in Ministry of Health, Ministry of Labor, Social Protection, and Family and the Ministry of Economy (Husman, 1999). According to the Convention no. 161 (1985), chapter II, Article 5, the functions of occupational health services are (ILO, 1985):

- identification and assessment of the risks and health hazards of the employee at the workplace;
- surveillance of the factors in the working environment and working practices which may affect workers' health, including sanitary installations, canteens, and housing where these facilities are provided by the employer;
- advice on planning and organization of work, including the design of workplaces, on the choice, maintenance and condition of machinery and other equipment and on substances used in work;
- participation in the development of programs for the improvement of working practices as well as testing and evaluation of health aspects of new equipment;
- advice on occupational health, safety and hygiene and on ergonomics and individual and collective protective equipment;
- surveillance of workers' health in relation to work;
- promoting the adaptation of work to the worker;
- contribution to measures of vocational rehabilitation;

- collaboration in providing information, training and education in the fields of occupational health and hygiene and ergonomics;
- organizing first aid and emergency treatment;
- participation in analysis of occupational accidents and occupational diseases (ILO, 1985).

Among first countries in the European Union that have ratified the ILO Convention no. 161 were: Sweden (1986), Finland (1987), Hungary (1988), Croatia (1991), Macedonia (1991), Slovenia (1992), Czech Republic (1993), Slovakia (1993), Bosnia and Herzegovina (1993), Germany (1994). Obviously, Eastern Europe countries were not analyzed in this study.

According to each country's specificity, national laws establish occupational health services. Ratification at national level allows for the next "step"- implementation in each branch of the national economy (at big, medium and small enterprises level).

The legislative structure of OHS varies greatly in the mentioned countries. For example, Germany has a relatively detailed legislative structure of OHS complemented by lower-level regulations and divided into two parts: 1) technical measures as security of dangerous equipment, and protection against work environment risks; 2) social measures, as reducing of working hours for specially protected groups (young mothers, people with disability). In Sweden and Finland, it is a liberal approach without any limitations.

That is why employers and employee assignees at the organization level elaborate the OHS patterns for accessibility and financing (Ahonen, 1999). Another position is the OHS subordination. So,

- In Germany, the Federal Ministry of Labour and Social Affairs is the key institution of management and control. The basic document is "The act of Security and Work Health";
- In Sweden, the responsible institution is the Ministry of Labour, Family and Social Affairs and Equal Opportunities. The basic document is "The law of work environment";
- In Finland, the main institutions are the Ministry of Social Affairs and Health and Ministry of Labour. The basic documents are "The Occupational Health Service Act", "The Labour Security Act", "The Labour protection and affair act".

On the other side, the development of the *National Strategy* and *National Policy* in the domain of OHS is also important. For OHS to be resistant a substructure is needed. For a good structure, a step-by-step strategy is recommended. Every country should analyze the actuality of OHS to develop its own *National Strategy* and *Activity Program*. The pioneer countries that ratified Convention no 161 (1985):

- Germany elaborated the OHS National strategy;
- Finland after the implementation period made a re-evaluation and adopted a proper OHS strategy;
- Sweden has not yet elaborated its own OHS strategy.

According to the interpretation of the legislation, the objectives in 17 European countries can be divided into four categories:

 Comprehensive objectives, including risk assessment and prevention, the promotion of health and well-being, including curative care: Finland, Italy (universities and the National Sanitary System do curative care – teaching hospitals); day hospitals and outpatients are present in the hospital unit of occupational health, environmental investigations are carried out by the Regional Agency for Environmental Prevention;

- Comprehensive objectives, including risk prevention, the promotion of health and well-being excluding curative care: Austria (curative care is not designated by law, but out of the minimum time provided by law curative care is theoretically possible as long as the employee pays for it and not the social insurance system), Belgium, Denmark, Germany, The Netherlands, Norway, Sweden and Switzerland (occupational health and safety measures based on risk assessment);
- Prevention and protection oriented objectives: France, Greece, Luxembourg, Portugal, Spain and Ireland;
- OHS assist employers to provide curative care excluded by legislation: France, Germany, Portugal (can be on a contractual basis, however).

Note: Germany, France, and Portugal can be included in 2 categories.

**Germany** - Occupational safety and health services aim to protect the life of people at work and their capacity to work and to preserve a humane work environment. Employers have an obligation to protect the health and safety of workers and provide medical attendance by a company physician.

**France -** OHS are preventive and aim to monitor the health of workers and adapt workplace according to physiological and psychological requirements, notably industrial hygiene and risks of contagion. OHS must conduct workplace surveillance and advise the employer on improvements. All employees must have annual medical check-ups and follow-ups of occupational diseases or injuries. OHS must produce an annual action plan on work environment covering risks, jobs, and working conditions.

**Portugal** - Services of safety, hygiene, and occupational health should be oriented towards establishing and managing working conditions, <u>safeguarding</u> the mental and <u>physical health</u> of workers, providing technical prevention, training, and information to workers and promoting the participation of employers and employees.

**Finland** - The objectives of OHS are a healthy and safe work environment, a well-functioning work environment, the prevention of occupational diseases and the promotion and maintenance of work and functional ability.

**Italy** - Every private and public company must protect workers' health. Employers are obligated to protect the health and safety of their workers and provide medical attendance by an authorized company physician. OHS must conduct workplace surveillance and advise employer on improvements.

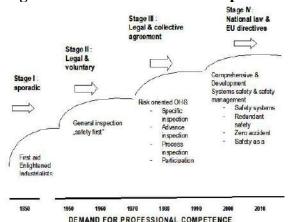


Figure 1. Model - scheme of occupational health services development in Finland.

Source: Rantanen J. Evolution of occupational health services in Finland, Työterveyslääkäri, 1998, 1:4-9.

OHS are organized according to some national legislative particularities of 17 European countries:

- Training people in the domain of OHS: Austria, Belgium, Denmark, Finland, Germany, Greece, Italy, Holland, Portugal, Spain, Switzerland.
- Qualification, time management, and faculties: Austria, France, Germany, Denmark, Germany, and Switzerland.
- Specific OHS goals: Austria, Belgium, Denmark, Finland, Germany, Greece, Italy, Holland, Norway, Luxemburg.
- The quality management of OHS legislation: Denmark, Holland, Norway, Finland (for example, the declaration for continue quality development).
- No legislative rules for quality OHS management: Sweden, United Kingdom.
- Organizational patterns for OHS: Belgium, Finland, Holland, France, Denmark.

The organization of OHS patterns and its financing differ in according to the country, because of various historical methods in the occupational health system and economic development of the countries.

In Figure no. 1 is represented a schematic model of the occupational health services development in Finland. Finnish and Italian occupational health services have complete objectives, with risk assessment and prevention, strengthening health workers, with the involvement of curative and preventive services at the workplace (Rantanen, Lehtinen, 1999; Rapas, 2010; Pisla, Bahnarel, Ferdohleb, 2014).

Occupational health services can be strengthened by following steps (Menckel, 1993; Libert, et al., 1998; Felszeghi, 2014; Kim, R., et al., 2014).

I stage - Beginner services (Beg. OHS), which is a reasonable starting point for the progressive development of workplaces and workers. This form of service enables the employment of nurses and primary health care workers from workplace inspectors who are trained in OHS field. The objective is to prevent and control occupational risks and hazards to health and lives of employees.

II stage - Basic Services (B OHS) are based on the infrastructure of health service localized in the workplace geographically closer. The provision of services may vary depending on the company and community needs. Staff in the BOHS consists of doctor and medical assistant specialists in medicine / occupational health.

III stage - International standardized services (IS OHS) are based on provisions of ILO Convention 161 (1985) ratification with minimum requirements of OHS objectives for each country. Service infrastructure has several optional forms; the aim is mainly preventive, international standard curative services can be provided to workers. Occupational Health Unit with the multidisciplinary team (public or private MSI) is headed by the occupational health specialist doctor and accredited according to the requirements of EC / ILO / WHO (Rantanen, 1999; Rapas, 2010; Pisla, Bahnarel, Ferdohleb, 2014).

IV stage - Multiple specialized services (MS OHS) are usually implemented on large enterprises in industrialized countries and/or they may be provided by multiple specialized health centers. Employees of the multidisciplinary team are physicians-specialists in occupational health, ergonomists, occupational health assistants, psychologists, security engineers, etc. Service structure is represented by specialists for complete coverage of the relevant aspects of occupational health.

Beginner OHS and Basic OHS are found in developing countries – at small and very small enterprises level, for non-formal sectors and the self-employed population that cannot start immediately OHS at the international standard. The considerable growth of the necessity and urgency of implementing the OHS in developing countries were expressed by ILO and WHO

concerning basic occupational health services in order to improve the overall coverage of the OHS with reasonable costs, methods and technologies available for small businesses, non-formal employers, patented employees, self-employers (Rantanen, 1999).

Table 1. The actors involved in financing occupational health services.

	Country:	State	Employers	Trade	Public social	Insurance
				unions	security	companies
					agencies	
1.	Austria					
2.	Belgium					
3.	Finland					
4.	Germany					
5.	Italy					
6.	Portugal					
7.	Sweden					
8.	Switzerland					

The rules are used to calculate the number of hours needed for occupational health input from each group) per 1000 employees:

The **Austrian** Association of Occupational Health Physicians recommends a certain amount for the hourly rate of occupational health physicians; generally speaking, the market regulates the remuneration. For enterprises with less than 50 employees, the Austrian Accident Insurance Board provides OHS free of charge. In those with more than 50 employees, a physician should spend at least approximately 40 minutes/employee/a year (there are precise specifications depending on the number of employees). In the enterprises with less than 50 employees, regular inspections by OHS are needed every year. In the enterprises with less than 11 employees, one inspection every two years and additional inspections on particular occasions are required (accidents at work, new work procedures, new agents, etc.).

**Belgium** - minimum prices per year are imposed by the federal government in order to avoid market mechanisms which would decrease the quality of service for external services: workers with special risks, workers submitted to compulsory examination for risks from visual display units and manual lifting tasks, workers without special risks and thus not submitted to periodic medical examinations.

**Finnish** occupational health services - funding is directly based on the market price. The Social Insurance Institute reimburses up to 50% of costs; separate compensation is provided for preventive and curative care.

**France -** from one to a monthly number of hours of services to enterprises from OHS is required; one-third of that time should be used in the company.

**Luxembourg-** the semi-public National Occupational Health Services can charge not more than 0.2% of the total salary mass to employers. The other occupational health services are functioning according to a market-based price.

**Germany -** 0.1-1.2 hours/insured person is required depending on the basic risk potential; special regulations exist for small and middle- sized enterprises in some insurance companies.

In many cases, these schemes are more useful for large companies than for small and middle-sized enterprises because of the market prices.

Italy, Greece, Ireland, the Netherlands, Norway, Portugal, Spain, and Sweden - funding is directly based on the market price.

ILO Convention no. 161 (1985) recommends, according to national background and practices, the following organizational models of occupational health services:

- OHS integrated within companies / institutions (internal);
- OHS covering more companies / institutions (consort);
- Private medical institutions, which offer OHS;
- Public medical institutions, which offer OHS;
- OHS private-public partnership;
- Public social security institution.

Table 2. Occupational Health Services Models used in some EU countries.

		Finland	Germany	Sweden	Italy	France
1.	Integrated "built in" OHS – internal service					
2.	Joint OHS with different companies					
3.	Private medical institutions, which offer OHS					
4.	OHS specialized for certain groups of workers					
5.	Public medical institutions, which offer OHS					
6.	Health care centers proving OHS					
7.	State OHS for its employees					
8.	Company doctor (full or part-time)					
9.	OHS provided by statutory industrial accident insurance funds					
10.	Defense medical service					
11.	Local authorities providing OHS					

From the mentioned points and international experience, occupational health services structure must be multidisciplinary and multi-specialized. Membership and number of service personnel will be determined by the volume of needs issued by them (Chu, et. al., 2000).

German law requires occupational health services to be provided by specialists in occupational health and those in occupational safety (labor inspection engineers). Specialists in the field and qualified employees from specified area, described in ILO Convention no. 161(1985), are employed when necessary in enterprises / large companies in case of service extension and forming a consortium. Swedish National Board of Occupational Safety and Health plans to encourage a multidisciplinary approach by a system of internal audit of enterprises. In Finland, occupational health specialists are licensed hygienists-physicians, nurses, and physiotherapists who have been

specially trained to work in the field. Also, this service involves ergonomics experts, psychologists, and social workers, who obtained training and knowledge in the field. Requirements for the OHS specialists are described in the Decision of the State Council regarding occupational health services.

ILO Convention no. 161 (1985) stipulates that professional independence of employees in occupational health services and the exclusion of any manipulation by the employer is a vital activity. In Finland, there is legislation that supports the independence of occupational health specialists against employers, employees, and their representatives. In the same time, there are also some shortcomings to this topic. "Occupational Safety and Health Act" in Germany mentions the independence of OHS structure. Occupational health services Company in Sweden supported by legislation and promoted by the International Labor Organization - Swedish office will maintain itself independent from operators.

Worldwide, only 32 countries have ratified the ILO Convention no. 161 (1985) concerning occupational health services. Since 1999 in Moldova we have accumulated arguments in favor of ratification of this document and development of occupational health services in line with recommendations of the International Labor Organization and World Health Organization. In Table 3 are listed the countries that ratified the convention.

Table 3. States that ratified the International Labor Organization Convention no. 161 (1985).

		Date of			Date of
No.	Countries:	ratification	No.	Countries:	ratification
1.	Sweden	01.07.1986	17.	Benin	10.11.1998
2.	Mexico	17.02.1987	18.	Chile	30.09.1999
3.	Finland	27.04.1987	19.	Serbia	24.11.2000
4.	Hungary	24.02.1988	20.	Colombia	25.01.2001
5.	San Marino	19.04.1988	21.	Antigua and Barbuda	16.09.2002
6.	Uruguay	05.09.1988	22.	Zimbabwe	09.04.2003
7.	Guatemala	18.04.1989	23.	Poland	15.09.2004
8.	Brazil	18.05.1990	24.	Turkey	22.04.2005
9.	Croatia	08.10.1991	25.	Seychelles	28.10.2005
10.	The former Yugoslav	17.11.1991	26.	Montenegro	03.06.2006
	Republic of Macedonia				
11.	Slovenia	29.05.1992	27.	Luxemburg	08.04.2008
12.	Czech Republic	01.01.1993	28.	Niger	19.02.2009
13.	Slovakia	01.01.1993	29.	Ukraine	17.06.2010
14.	Bosnia and Herzegovina	02.06.1993	30.	Belgium	28.02.2011
15.	Germany	17.10.1994	31.	Bulgaria	01.05.2012
16.	Burkina Faso	25.09.1997	32.	Gabon	28.07.2015

On the other hand, in the scientific laboratory of Occupational Health from the National Center for Public Health the concept of Occupational Health Medicine (currently Occupational Health Services) was developed, but failed to be viable because of the considerable changes in health system financing (introduction of compulsory medical insurance) and the professional profiles of the republic (liquidation of large enterprises and increasing number of small / very small ones).

Occupational Medicine is recognized as a clinical and pre-clinical system. The multiclinical character consists in the interference of general pathological consequences of working and work conditions with all clinical specialties (pneumology, internal medicine, neurology, psychiatry, hematology etc.) and preclinical (biochemistry, physiology, genetics, hygiene, epidemiology, etc.).

Occupational medicine being by excellence a dynamic compartment insists on the update of its configuration. It is dynamic from the point of development and diversification of industrial type of production, an aspect which enlarges the etiological background of occupational diseases, and also the progress of biology and medicine, especially in the field of genetics, immunology, immunopathology, imagistic, etc. (Cocarla, 2009; Toma, 2006).

Occupational medicine is a borderline medical specialty, with pronounced multidisciplinary character, and socially strongly linked. It is a difficult specialty, mainly preventive, often pretechnique and with exact terms from the field of physiology, pathology, legislation, etc. (Pauncu, 2014). One-third of our life unfolds at the workplace, and the work conditions have a big impact on the employees' health. All professionals from the health services field should know the causality relation between health and work and that between work and health (Pauncu, 2014).

The society and technical progress are in continuous dynamics, obliging specialty doctors to adapt to new conditions. The volume and quality of knowledge with which future specialists need to be familiarized can be taught in an attractive way, combining classic and modern teaching techniques (Pauncu, 2014).

In the Republic of Moldova, the Reforms of Occupational Health Services/harmonization of the Convention and Directives by UE, WHO, IOM are justified by the following numbers:

- 21.9 thousands of workplaces do not correspond to sanitary-hygienic requirements;
- 27.8% occupations implies hard physical work;
- the incidence of diagnosis of professional morbidity 1.65 of 100 thousands of employees, 1.82 times lower than the average of this indicator in 27 EU countries.

From these arguments, in 1999, the scientific laboratory of "Occupational health" of the National Centre of Public Health, in the frame of the results of the state project "Study of the efficiency of the sanitary supervision in work hygiene and of the professional pathologies service, in 1997-1998", which encouraged to start the project "Conception of the Occupational Health Service" first variant – June 3, 1999, next – December 18, 2002 and the third in 2004 receiving positive claims from all persons from occupational medicine services.

Unfortunately, this variant did not have political support, which was explained through the adoption of other afferent normative acts during these years with the precise objective to regulate the activities of National Company of Insurances in Medicine (http://lex.justice.md/index.php?action=view&view=doc&lang=1&id=296962).

#### **Conclusions**

Basic Occupational Health Services are listed in the WHO objectives, announced at Alma-Ata - WHO Global Strategy on Occupational Health for All.

A wide variation is prevalent among legal basis, scope, coverage, basic guidance, content, and resources available in occupational health services to Finland, Germany, and Sweden. However, functionally OHS development actions are oriented in parallel directions: occupational risk prevention, health promotion, providing curative care, vocational rehabilitation. It is very important to initiate and continue the process of ratification and implementing the ILO Convention no. 161 (1985). These will facilitate the development of occupational health services within the institutions and enterprises, both public and private as in all the branches of Moldavian economic activity.

Some aspects of ratification and implementation of this document are worth mentioning here:

- Political aspect: Ratification of the ILO Convention no. 161 (1985) will help promote Moldova's image as a democratic state that guarantees access to quality occupational health services for all employed persons.
- Normative aspect: The provisions of the ILO Convention no. 161 (1985) concerning occupational health services are compatible with international legal instruments and not contrary to national law.
- Organizational aspect: Responsible for implementation of ILO Convention no. 161 (1985) concerning occupational health services are the Ministry of Health & the Ministry of Labor, Social Protection, and Family.
- Financial aspect: In order to achieve the ILO Convention goals, the financial resources available in the general government will be used, the partial contribution of employers under the legislation in force and the insurer (if applicable), including official assistance provided by external partners for development.
- Economic aspect: Ratification of Convention no. 161(1985), will help to improve employee health indicators, and indirectly, will facilitate increasing levels of socioeconomic development at national level.
- State Supervisory Board of Public Health, under the Ministry of Health, will identify, assess and monitor risk factors in the occupational environment, will propose measures for occupational illnesses prevention and will supervise the health status of persons subject to action occupational risk factors.

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## Micro-test system for rapid isolation and identification of *Candida* species in urinary tract infections

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#### **Abstract**

**Objectives.** We tried to create a culture medium and a method used to rapidly isolate and identify the yeasts of *Candida* genus.

**Material and Methods.** The isolation and identification of *Candida* genus yeasts have been accomplished using the micro-test system alongside the classical method. The strains of reference were collected from the Bacteriological Laboratory of the National Centre for Public Health.

**Results.** Choosing the culture medium for a prompt isolation of the germs represents a primordial element for determining the correct diagnosis. The elaborated medium increases the sensibility, selectivity and the specificity of the test used to identify *Candida* genus yeasts. The method involves the insertion of the material into the culture medium followed by a further incubation and identification of the *Candida* genus yeasts.

**Conclusions.** We have created a culture medium that allows a fast identification of the *Candida* genus yeasts. The medium is sensitive, economical and easy to use, as well as accessible for the microbiological labs of various levels. Comparing to the usual practices, the elaborated method gives us the possibility to obtain a result in 9 hours after the inoculation of the pathological material.

**Keywords**: Candida species, fast identification, culture medium, urinary tract infections.

#### Introduction

The urinary tract infections (UTIs) are among the most often infectious diseases in the medical practice. The positive prediction for UTIs clinical symptoms varies from 0,5 or lower in case of urethral symptoms for women. A significant number of UTIs evolve asymptomatic, and in case of two-year-old children the symptomatology of urinary tract infections is non-specific (Buiuc and Negut, 1999).

The frequent occurrences of mycosis, their slow and often unpredictable evolution are determined by sometimes thoughtless use of a wide range of antibiotics that have modified the biological balance between the bacteria and micromycetes in different ecological niches (Coman and Mares, 2000).

According to specialists "conditions that predispose to candiduria include diabetes mellitus, antibiotic and corticosteroid therapy, as well as factors such as local physiology and disturbance of urine flow. Lower urinary tract candidiasis is usually the result of a retrograde infection, while renal parenchymal infection most often follows candidemia. In addition to asymptomatic candiduria, recognized clinical forms of candidal urinary tract infections include bladder infection, renal parenchymal infection, and infections associated with fungus ball formation" (Fisher et al., 1982).

The situation could be improved if removal of some predisposition factors is considered. The study of Malani and Kauffman found out that in almost 50% of asymptomatic patients candiduria could be cleared by the elimination of indwelling catheters and antibiotics (Malani and Kauffman, 2007).

The diseases caused by micromycetes are not properly addressed in terms of etiopathogenesis and therapy, as they become the object of study for the practitioner or the laboratory only in critical situations when the clinical evolution of the disease or the classical treatment take a dramatic turn. (Coman and Mares, 2000; Bouza et al., 2001).

Very often, urogenital mycoses have a chronic evolution with frequent recurrences. Among Candida spp., *Candida albicans* is the most common infectious agent that colonize the skin, gastrointestinal tract and reproductive tract (Parveen Surain Dabas, 2013).

*C. albicans* is reported as the most common species that causes urinary tract infections, non-albicans Candida species are better adapted to the environment urinary tract. According to some studies, that more 50% of urinary isolates belong to non-albicans species (*C. tropicalis*, *C. glabrata*) (Sobel et al., 2011).

The incidence of candiduria depends on the setting and population that are studied and has to be carefully compared because of the above-outlined discrepancies with opinions on candiduria. The general consensus is that *Candida* spp. is the most frequently isolated pathogen in nosocomial urinary tract infections (Alvarez-Lerma et al., 2003, Richards et al., 2007).

There is evidence that the incidence is linked to antibiotic usage (Weinberger et al., 2003). In general, most incidence rates that based on culture results are likely underestimated, because standard urine culture is not very sensitive. Shay and Miller estimated in 2004 that the incidence of candiduria was ~25,000 cases per year in the United States.

UTIs caused by *C. albicans* are reported more frequently in catheter-associated UTIs than in non-catheter-associated infections (Achkar & Fries, 2010).

The presence of *Candida* spp. on any surface of the body is abnormal, even if it does not cause any health injuries, because *Candida* spp. develops some toxins that provoke the weakening of the immune system (Lipovsky and Hoepelman, 1999).

If UTIs, caused by *Candida* spp., are not diagnosed and treated earlier, can lead to the development of severe complications (recurrent UTIs, blood infection and renal parenchyma damage, renal scarring, hypertension, renal insufficiency or renal failure) (Gelotar, Gandha and Sinha, 2012).

#### Material and the Methods

This study was completed using materials and standard materials recorded in the Republic of Moldova by the Ministry of Health. The study included 126 urine samples collected from the hospitalized patients with UTIs.

Sample collection: All samples were collected by midstream urine samples in a sterile container.

Sample testing: All the samples were tested as follows.

Step 1: Direct microscopy by using gram stain to identify yeast cells, budding yeast cells, hyphae and pseudohyphae.

Step 2: Culture was done in 2 Sabouraud Dextrose Agar plates with antibiotics (chloramphenicol and cycloheximide). One plate was incubated at room temperature (25°C-28°C) for mycelia growth and other at 37°C for yeast growth. Both plates were examined every 3rd day for a period of three weeks before declared negative.

Step 3: The growth of bacterial cultures was examined by culture characteristics, using Lactophenol Cotton Blue solution, germ tube test, sugar assimilation test.

The reference strains, *C. albicans* ATCC 10231, *C. albicans* ATCC 38248, *C. albicans* ATCC 36232, *C. tropicalis* ATCC 1369 and *C. krusei* ATCC 24480 were received from the Microbiological Laboratory of the National Centre for Public Health.

Data analysis was performed using statistical and computerized data processing (Epi Info 7 software) through the comparative method with the calculation of the standard errors, confidence intervals with the appreciation of differences between the experimental group and control group according to the criteria "t -Student" and significance threshold "p".

#### **Results**

During the conducted research, a new culture medium has been created in order to rapidly indicate the presence of *Candida* yeasts - DSM*Cand* (Dosed Selective Medium for Candida).

This specially created environment contains the following ingredients: dry peptone broth, glucose, gelatine, the 199 medium, sodium dihydrogen, potassium hydrogen, phenol red and ciprofloxacin. The dry peptone broth, the glucose, gelatine and the 199 medium serve as a nutritional basis including all the necessary components that facilitate the growth and development of the *Candida* genus yeasts.

The Ciprofloxacin is the selectivity factor because it inhibits the growth and development of other microorganisms, thus ensuring the specificity of the growth environment.

The identification of the *Candida* genus yeasts occurs under conditions of pH formed of sodium dihydrogen phosphate, potassium hydrogen and the substances obtained after splitting the glucose with phenol red.

The culture medium is fixed on the bottom of a 10,0 mL vial which serves at the same time as a vessel for multiplication and identification of *Candida* genus yeasts. In order to identify the yeasts, 2.0 mL of sterile physiological serum, in which the media is dissolved and the seeds are inoculated, is added in the vial. The vial is incubated for 9-24 hours at a temperature of 37°C. In case Candida is present, the mixture turns from red to yellow.

We created 9 types of DSMCand with different ingredients as seen in Table 1.

Table 1. The influence of culture medium ingredients on Candida genus yeasts identification

$N_{\underline{0}}$	Media Ingredients	The options of media composition								
		1	2	3	4	5	6	7	8	9
1.	Dry peptone broth	+	-	+	+	+	+	+	+	+
2.	Glucose	+	+	-	+	+	+	+	+	+
3.	Gelatin	+	+	+	-	+	+	+	+	+
4.	Sodium Hidrogen	+	+	+	+	-	+	+	+	+
5.	Potassium dihydrogen	+	+	+	+	+	-	+	+	+
6.	199 Media	+	+	+	+	+	+	-	+	+
7.	Phenol red	+	+	+	+	+	+	+	-	+
8.	Ciprofloxacine	+	+	+	+	+	+	+	+	-
Results of identification		$\Diamond$	-	-	$\Diamond$	¤	¤	X	X	$\Diamond$

*Note:* "+" – indicates the presence of the ingredient, "-" – the absence of the ingredient, x - the growth and development of yeasts that allow a 24 hours identification in incubation conditions under  $37^{\circ}$ C;  $\pi$  – doesn't allow the yeasts identification;  $\diamond$  – the growth and development of yeasts that allow on 4-5 hours identification in incubation conditions under  $37^{\circ}$ C.

Also, the sensibility of the medium according to the quantitative composition of the ingredients has been tested. Therefore, 5 different quantitative compositions of the culture medium have been created and the best option representing an optimal ratio of ingredients for a fast *Candida* genus yeast identification has been detected (fig. 1).

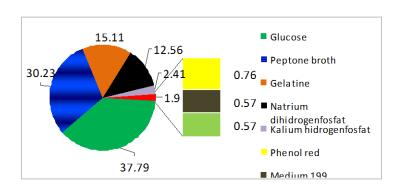


Figure 1. The ingredients report in the DSMCand

It is worth mentioning the fact that in order to prepare the right medium to conduct an analysis, the ingredients are used in small proportions, which makes the growth medium economical enough. The identification time for *Candida* genus yeasts depends on the initial concentration of the germs in 1 mL/g of research material (Table 2).

Table 2. The identification time of *Candida* genus yeasts according to their initial concentration in the research material

concentration in the research material											
Concentration	Identification time in hours										
(CFU/mL, g)	1	2	3	4	5	6	7	8	9	24	
$10^{1}$	-	-	-	-	-	-	-	+	+++	+++	
$10^{2}$	-	-	-	-	-	-	-	+	+++	+++	
$10^{3}$	-	-	-	-	-	+	++	+++	+++	+++	
$10^{4}$	-	-	-	-	+	++	+++	+++	+++	+++	
$10^{5}$	-	-	-	+	++	++	+++	+++	+++	+++	
$10^{6}$	-	-	+	+	++	++	+++	+++	+++	+++	
$10^{7}$	-	+	+	++	++	+++	+++	+++	+++	+++	
$10^{8}$	-	+	+	++	+++	+++	+++	+++	+++	+++	
109	-	+	++	+++	+++	+++	+++	+++	+++	+++	
The control	-	-	-	_	-	-	-	-	-	_	

*Note:* "-" – the initial red color (negative result); "+" – light yellow (weakly positive result); "++" – yellow (positive result); "+++" – dark yellow (strong positive result).

The identification of the unique *Candida* yeasts cells is possible after 9-24 hours of incubation at  $37^{\circ}$ C, while for the concentration of  $10^{3}$ - $10^{4}$  CFU/mL within 5-6 hours of incubation at  $37^{\circ}$ C.

In order to determine DSMCand medium selectivity, several serial experiments were performed using 4 clusters of microorganisms for 30 times. The results of the experiments prove that the DSMCand medium has a high selectivity towards *C. albicans* depending on the initial concentration of the *Candida* and microorganisms in the mixture. The identification of *C. albicans* in a concentration of 10<sup>5</sup> CFU/mL of the following microbial associations: *Candida albicans* 10<sup>5</sup>

CFU/mL + Staphylococcus aureus 10<sup>6</sup> CFU/mL; Candida albicans 10<sup>5</sup> CFU/mL + Pseudomonas aeruginosa 10<sup>6</sup> CFU/mL; Candida albicans 10<sup>5</sup> CFU/mL + Escherichia coli 10<sup>6</sup> CFU/mL is possible after 6 hours of incubation at a temperature of 37°C. The identification of *C. albicans* in a concentration of 10<sup>2</sup>, 10<sup>3</sup>, 10<sup>4</sup> in 1 mL in the mixture of *S. aureus* 10<sup>6</sup> CFU/mL; *P. aeruginosa* 10<sup>6</sup> CFU/mL; *E. coli* 10<sup>6</sup> CFU/mL is succeeded after 9 hours (Table 3).

We have established the statistical accuracy of the indices assessing DSM Cand selectivity in the following clusters: C. albicans  $10^5$  CFU/mL + S. aureus  $10^6$  CFU/mL; C. albicans  $10^5$  CFU/mL + P. aeruginosa  $10^6$  CFU/mL; C. albicans  $10^5$  CFU/mL + E. coli  $10^6$  CFU/mL comparing to the combinations in which the concentration of C. albicans is of  $10^2$ ,  $10^3$ ,  $10^4$  CFU/mL (p<0.001).

Table 3. The DSMCand medium selectivity

Evaluated associations among	Nr.	Id	me	p		
microorganisms	exp	6	9	24	6 - 9	9 - 24
		% ± ESp	% ± ESp	% ± ESp	hours	hours
Candida albicans $(10^2)$	40	0	100	100	-	-
Staphylococcus aureus (10 <sup>6</sup> )						
Candida albicans $(10^2)$	40	0	97.5±1.42	97.5±1.42	-	< 0.05
Pseudomonas aeruginosa (10 <sup>6</sup> )						
Candida albicans $(10^2)$	40	0	100	100	-	-
E.coli (10 <sup>6</sup> )						
Candida albicans (10 <sup>3</sup> )	40	10.0±0.71	97.5±1.42	100	< 0.001	< 0.05
Staphylococcus aureus (10 <sup>6</sup> )						
Candida albicans (10 <sup>3</sup> )	40	12.5±0.86	100	100	< 0.001	-
Pseudomonas aeruginosa (10 <sup>6</sup> )						
Candida albicans (10 <sup>3</sup> )	40	17.5±0.94	95.0±1.53	100	< 0.001	< 0.05
Escherichia coli (10 <sup>6</sup> )						
Candida albicans (10 <sup>4</sup> )	40	60,0±1.22	97,5±1.42	100	< 0.001	< 0.05
Staphylococcus aureus (10 <sup>6</sup> )						
Candida albicans (10 <sup>4</sup> )	40	70,0±1.26	100	100	< 0.05	-
Pseudomonas aeruginosa (10 <sup>6</sup> )						
Candida albicans (10 <sup>4</sup> )	40	65.0±1.25	100	100	< 0.001	-
Escherichia coli (10 <sup>6</sup> )						
Candida albicans (10 <sup>5</sup> )	40	90.0±1.41	100	100	< 0.001	-
Staphylococcus aureus (10 <sup>6</sup> )						
Candida albicans (10 <sup>5</sup> )	40	95.0±1.53	100	100	< 0.05	_
Pseudomonas aeruginosa (10 <sup>6</sup> )						
Candida albicans (10 <sup>5</sup> )	40	95.0±1.53	100	100	< 0.05	_
Escherichia coli (10 <sup>6</sup> )						

We proved the statistical veracity of selected indeces for identification of C. albicans in bacterial combinations during 6 - 9 hours (p 6 - 9) and 9 - 24 hours (p 9 - 24), where (0.05>p<0.001). It's worth mentioning that the DSMC and medium has a selectivity towards C. albicans, preventing the growth and development of other microorganisms of the mixture.

In order to decide the sensibility of the DSM*Cand* medium, a series of experiments have been conducted using 7 *Candida* genus yeasts strains with concentrations of 10<sup>4</sup> and 10<sup>5</sup> CFU in 1 mL, in 12-19 repetitions. By comparison with it, two other media were used for the growth of yeasts: Agar Sabouraud with glucose and Sabouraud broth with glucose (Table 4).

Table 4. The sensibility of Candida genus yeasts identification test using DSMCand medium

№		Nr.	The conce	ntration of	micro	organis	ms CF	FU/mL		
		of	suspension, and the indication (by color) during 6							
	The microbial species	repet	hours of incubation at 37 ° C (%)							
		ition	DSM	Agar		Sabouraud				
		S		Sabouraud		Broth				
			$10^{4}$	$10^{5}$	$10^{4}$	$10^{5}$	$10^{4}$	$10^{5}$		
1.	C. albicans ATCC 10231	15	$93.3 \pm 1.61$	100	0	0	0	0		
2.	C. albicans ATCC 38248	12	100	100	0	0	0	0		
3.	C. albicans *	16	$93.7 \pm 1.53$	100	0	0	0	0		
4.	C. albicans *	13	84.6±1.42	100	0	0	0	0		
5.	C. albicans ATCC 36232	18	100	100	0	0	0	0		
6.	C. tropicalis ATCC 1369	12	88.9±1.63	100	0	0	0	0		
7.	C. krusei ATCC 24480	19	94.7±1.25	100	0	0	0	0		
Total		102	93.6±0.41	100	0	0	0	0		

*Note:* \* - clinical strain

We established that the DSM*Cand* medium is much more sensible than the other two (Agar Sabouraud with glucose and Sabouraud Broth with glucose): in 93,6% of the cases, at a concentration of 10<sup>4</sup> CFU/mL, the identification of the *Candida* genus yeast was possible within 6 hours of incubation at a temperature of 37°C; the rate of success reached 100% for a concentration of 10<sup>5</sup> CFU/mL.

The resulting culture medium has been kept at the bottom of the vail at a temperature of 4-7°C for 2 years (observational study), without changing its initial properties.

126 urine samples from the hospitalized patients with UTIs were examined. *Candida* genus yeasts were detected in 5 patients accounting for 3,9% of the total sample. The results have been confirmed in 100% of the cases using the classical methods of investigation.

#### **Conclusions**

Considering the fact that the UTIs are frequent in medical practice, the improvement and development of rapid isolation and identification methods of pathogenic and conditioned pathogenic microorganisms is most welcome allowing early treatment and preventing complications.

The DSM*Cand* medium has a high specificity and sensitivity. The method allows an identification of *Candida* genus yeasts within a short period of time: from 4-5 hours up to 9-24 hours, depending on the initial concentration of the germs in 1 mL or gram of product.

DSM*Cand* is cheap, easy to use and accessible to any microbiological labs. The validity of DSM*Cand* expires after 24 months.

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## Rescuing the other. Literary approaches towards animal's studies

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For love of those who are always ready to run into an endless and impossible rescue. For My mother Agata and my son Swiatopelek "He will reply, 'Truly I tell you, whatever you did not do for one of the least of these, you did not do for me.'

Matthew 25,45

#### **Abstract**

**Objectives.** This paper explores the anthropological difference through the analysis of bringing rescue. To bring rescue to the other should be founded on the recognition of his suffering. But in many cases, this recognition is faulty and is based on a misunderstanding of animal/insect world. **Material and methods.** Through a case study of two famous literary texts in which a human-beetle relationship appears (authored by F. Kafka and W. Gombrowicz), at the crossing of philosophy and poetry, the author of the article tries to approach as close as possible the experience of a transhumanist rescue attempt.

**Results and Conclusions.** The metamorphosis effectuates a true displacement in the relationship between man and animal but what Kafka describes is not the transfiguration of man into a beetle but rather the metamorphosis that affects the family.

**Keywords:** animal philosophy, metamorphosis, anthropological difference, strangeness, rescue

The origin of my approach towards otherness under the figure of the animal proceeds from the interest for the fable and the parable as the margin of modern philosophy. The animal character in the fable is not the other, but the one, the same, the typical, a model of our vices and virtues. We are as slow as the turtle or as clever as the fox. Our behavior is reflected by the animals' more unequivocal expression. Following other recent antihumanist critique of the anthropocentrism of our morals, I would like to focus on the *distinction* between man and animal. Giorgio Agamben has advocated that this distinction is being drawn by something he called the "anthropological machine", which means that it is an effect of culture rather than a question of nature (Agamben, 2004). Therefore, his main interest is attached to zones of indeterminacy where bare life is being suspended between life and death, between law and no-law zone, created by law but at the same time suspending law, according to the logic of exception (as it is for the category of the "musulman" being a term borrowed from the Auschwitz-survivors terminology, especially Primo Levi). In this article, the study of this problematic human/animal dividing line is being observed not through the apparatus of law but the fabulous phenomenon of the metamorphosis. Within this process of change, a human character gradually acquires foreign features and starts to recognize in himself an animal.

A human self-consciousness is embodied in the animal's carcass. The most famous reference for reflecting on metamorphosis comes from Franz Kafka's novel under this title (Kafka, 2007). Kafka's novels and miniatures have acted as a stage of a number of philosophical approaches towards displacement in anthropological philosophy. Gregor Samsa metamorphosed into a beetle, alike the ape Red Peter from the "Report to an Academy" (Kafka, 2007) can be compared to mythical heroes or creatures that inhabit the philosopher's imagination. According to Martin Puchner who has successfully approached the crisis of anthropocentric philosophy by means of the category of "negative mimesis" observed in the three literary performances of Kafka (*A Report to an Academy*), Coetzee (*Elisabeth Costello*) and Beckett (*Act Without Words 1*) philosophy when it comes to the question of the animal needs a literary assistance: "Philosophy should not be abandoned but crossed – to use a loaded term derived from the breeding of animals – with poetry" (Puchner, 2007, p. 26).

In order to perform such a crossing, I will engage a second literary supplement for the purpose of our reading of the metamorphosis effectuated between man and animal. It will be a scene of rescue described by the polish novelist Witold Gombrowicz in his *Diary*, which I will quote at length beneath:

## "Tuesday

Something happened yesterday...something like a continuation of the dog at the estancia...And if I said that there is nothing equal somehow to the repugnance of the dilemma that I experienced... that I found myself where humanity must retch I could say this. I could also torment myself with it — it is really up to me.

I was lying in the sun, cleverly concealed in the mountain chain that sand forms when blown by the wind to the edges of the beach. [...] Some sort of beetles – I don't know what to call them – bustled along this desert for reasons unknown. And one of them, within my reach, lay upside down. The wind had overturned it. The sun beat on its belly, which certainly must have been unpleasant considering that this belly was usually left in the shade – there he lay, trashing his little legs – and it was obvious that nothing was to left to it except a monotonous and desperate trashing of its legs – and it was growing weak, perhaps it had been there for hours; it was dying.

I, a giant, inaccessible to him in my enormity, an enormity that made me invisible to it - I watched that trashing of legs... and extending my hand, extricated him from his agony. He moved ahead, returned to life in a split second.

I had barely done this when I noticed a little farther away, an identical beetle in an identical predicament. Trashing his little legs. I didn't want to move... But – why did you save that little guy and not this one?...why that one ...when this one...? You make one happy and the other should suffer? I took a stick, extended my hand – and saved him.

I had barely done this when I saw, somewhat farther, an identical beetle in an identical predicament. Trashing his little legs. And the sun was beating down on his belly.

I supposed to change my siesta into an ambulance for beetles in their death throes? But I had become too friendly with these beetles in their strangely helpless trashing ... and you will probably understand that once I had started this rescuing, I had no right to stop at some arbitrary point. It would have been an awful thing to do to this third beetle – to stop exactly at the threshold of his defeat. ... too cruel and somehow impossible to do....Bah! If there had been some sort of boundary between him and the ones I rescued, something that could have authorized me to stop – but there was absolutely nothing, only another ten centimeters of sand, always the same bit of sand, "a little farther away", it is true, but only "a little". And he waved his little legs in the same way!

Looking around however, I noticed "just a little" farther, another four beetles, trashing and being scorched by the sun – there was no helping it, I got up and rescued them all.

Then what should my eyes behold but the gleaming-hot-sandy plane of neighboring slope and on it five or six little trashing dots: beetles. I rushed to their rescue. I saved them.

And by this time I was so wrapped up in their suffering, I was so absorbed by it, that seeing new beetles all along the plains, ravines and canyons, an endless rash of tortured dots, I began to walk the sands as if I were demented, rescuing, rescuing, rescuing! But I knew this could not last forever – for it was not just the beach, but the entire coast, as far as the eye could see; it was sown with them so there had to come a moment when I would say "Enough!" The first unrescued beetle would have to happen, too. Which one should it be? Which one? Which one? Each time I said "this one"- I saved it, unable to bear that awful, almost vile arbitrariness – because why this one, why this one? Until I finally broke down, suddenly, easily, I suspended my empathy, stopped, thought indifferently, "Well, time to go back," and left. But the beetle, *the beetle I stopped with*, remained behind trashing its little legs (all of this was a matter of complete indifference to my by now, as if I had grown disgusted with the game – but I knew that this indifference was imposed upon me by the circumstances and I carried it within me like a foreign object)." (Gombrowicz, 1989, p. 38-40)

The one who hasn't experienced in his childhood an analogous dilemma of bringing rescue to beings who are counted in thousands and who pushed by an incomprehensible death drive urge to the water or through the sand, contradicting any logic of our own, must read this fragment with indifference. It will seem to him an extravagance of a pretentious writer. Nevertheless, this long quote is important because of the presence of a distinctive brace enveloping this experience, a brace of self-attention or self-consciousness that doesn't stop working. "I could also torment myself" or not torment myself with it — "it is really up to me". At the beginning Gombrowicz announces those two possible attitudes toward the experience he is bound to describe but ultimately, he ends with something that stands in opposition to this kind of self-control. The "indifference" that suddenly appears in order to displace the torment is all the same "foreign". The concern about the fate of every little beetle and the band-like mercy offered must, however, come to an end sometimes and seems at the discretion of the writer. But the indifference is welcomed as something foreign.

The rescue never comes to an end *in abstracto*, but always on one of the beetles, the one and not the other, who/which becomes at once the one, the first one who has been denied help offered to others. Although help has been denied because of the multitude, because of this "endless rash of dots", the one, the first one – "which one? Which one?" becomes the touchstone upon which stumbles the so-called listlessness.

Franz Kafka was well acquainted with both the torment of this rescue and the suffering of its disruption. He almost trained the power of such a self-imposed distress. But what fascinated him most was the foreignness that uses to appear at the end. It is specifically visible when in Kafka's miniatures and parables rather than popular zoomorphic figures some entomomorphic beings or hybrids like Odradek appear. They do not come to simplify the dramaturgy of the fiction; on the contrary, they make it more obscure as we are unable to specify the figure of the main character. We lose the ability to recognize easily his/its shape, to assign him/it to a specific species.

Our *experimentum mentis* will consist in reading Kafka's *Metamorphosis* as a lenticular reflection of the experience described by Gombrowicz. Let's begin by the fact that in the "Metamorphosis" the foreignness appears not at the end but at the very beginning in this "most risky moment, when the day falls on you", using Bulgakov words. In spite of hasty parallels, it is not the metamorphosis "into a monstrous cockroach" (Kafka, 2007, p.87) that surprises most Gregor Samsa. At the beginning, a much more important problem is the fact of his oversleep and consequently his

being late for work. If the metamorphosed Gregor Samsa could continue to be a solid and devoted employee of the company, which is a rarely coming home traveling salesman, he wouldn't even pay attention to his new appearance. Nevertheless, "his numerous legs, pathetically frail by contrast to the rest of him, [that] waved feebly before his eyes" were the main obstacle that impeded the possibility of jumping out of bed and catching the next train. The dramaturgical tension inside the main character is built on the axis of working and sleeping, while his entomo-morphic form is recognized only when it becomes an obstacle for one of those activities.

Meanwhile, outside Gregor Samsa's room, the foreignness amplifies in the same rate. And it is also the question of time that is its first generator. The callings at first innocent and calm become remarkably obsessive. The family can be justified by "uncertainty", but it is rather an uncertainty about its main provider, rather than about a son or a brother. The plaintive voice of the sister is as much premature as the visit of the chief clerk. The mistrust and the mechanisms of control are coming together in the immediate process of alienation. Its culmination is achieved yet before the metamorphosis of Gregor Samsa becomes explicit, in the laconic words of the chief clerk: "Something's fallen down in there". If we consider Gombrowicz's scene as a macro scale analogy for the *Metamorphosis*, Gregor becomes a beetle because of this quasi-suicidal temptation of finding oneself on a sandy dune in an endless and risky rush. The fate of a beetle corresponds to the fate of a traveling salesman who is suddenly stopped overturned by the wind. Only the fact of lying on the back creates a barrier that impedes Samsa from reaching the successive trains according to the timetables that he used to study in the evenings. "He would have used his arms and his hands to push himself up; but instead of them, he only had all those little legs continuously moving in different directions, and which he was moreover unable to control". In this loneliness of an undefined species – a traveling salesmen, who locks himself in his room even in his family house – the idea of a possible help coming from outside finally appears "two strong people [...] would easily suffice" (ibid., p.93). "Rescuing, rescuing, rescuing!" (Gombrowicz, 1989, p. 39) – alas, such a spontaneous interspecies bond does not emerge.

When we observe the juxtaposition of those two pieces of literature a geometrical reflection seems to appear. In Gombrowicz, the giant is the one who rescues, whereas in Kafka it is the beetle that is gigantic and needs two strong people to get it out of bed. When Gombrowicz, "a giant, inaccessible [...] in [his] enormity", gets up, Samsa swings "powerfully swung himself right out of bed" (Kafka, 2007, p. 94). To the main dilemma of Gombrowicz about when to stop the ceaseless rescue of beetles corresponds the troubling thoughts of Gregor Samsa himself. The first movement of the extended hand to save the first noticed beetle is as much unreflective than the acceptance of its new appearance and the readiness to go back to work of the metamorphosed salesmen. The disturbance of this first naïve approach comes when it occurs – against Samsa's expectation that his capacity to talk and to think is idiosyncratic and cannot lead to communication with the rest of the family. "Now" said Gregor, "in the knowledge that he was the only one present to have maintained his equanimity" (ibid., p.101) – this expression of calm control, drawing conclusions and planning that is inaugurated by this "now [then]" is a form of bizarre friendliness that appears too in Gombrowicz. "I had become too friendly with these beetles" is expressed by a more striking "feeling at home" (pl. zadomowienie) in the polish original (Gombrowicz). Gombrowicz says explicitly - however awkward it may sound - "I felt too much at home with those beetles". For the sake of the *Metamorphosis*, we could, therefore, paraphrase this as follows "I felt too much at home within this beetle". "[F]or the first time that day, he began to feel alright with his body; the little legs had the solid ground under them; to his pleasure, they did exactly as he told them; they were even making the effort to carry him where he wanted to go; and he was soon believing that all his sorrows would soon be finally at an end." This pulling oneself together, rediscovering one's mobility, one's

sensibility for pain, taste, hearing, etc., runs very quickly in the process of experiencing. It proves that the metamorphosis is a dynamic process and that it still proceeds "[f]or it was true to say that with each passing day his view of distant things grew fuzzier; the hospital across the road, whose ubiquitous aspect he had once cured, he now no longer even saw, and if he hadn't known for a fact that he lived in the leafy, but perfectly urban Charlottenstrasse, he might have thought that his window gave on to a wasteland where the grey sky merged indistinguishably with grey earth" (Kafka, 2007, p. 115) - "the gleaming-hot-sandy plane of neighboring slope" (Gombrowicz, 1989, p. 39).

The story is thus conducted in two languages, the one of friendliness toward the new-himself of Gregor Samsa and the one the growing alienation of the other inhabitants of his family house. The whole metaphoric of doors and windows opened and slammed shut or left open as "happens at times when a great misfortune has taken place" (Kafka, 2007, p. 98).

Indeed, unexpectedly, the metamorphosis opens the house of the Samsa family. Up to this time, the permanent absence of Gregor Samsa traveling for work has let the family live in a sort of isolation. None of the other members of the family was working and it is only with the metamorphosis that each of them is forced to establish contacts with the world in order to make a living. Gregor's "father running out to get breakfast for the little bank officials, his mother hurling herself at the personal linen of strangers, his sister trotting back and forth behind the desk, doing the bidding of the customers" (ibid., p.129). Besides this, some tenants are introduced inside the apartment and though Gregor is still isolated, to the most intimate moments of the family life join some strangers "they sat up at the table where formerly, Gregor had taken his meals with his father and mother" (ibid.). Nevertheless, the most foreign body inside this organism "the old charwoman", who was coming twice a day to relieve the mother and the sister from the hardest duties, not only knows about Gregor but without any real curiosity keeps opening the door of his room according to her caprice. It is on her robust boned and thick-skinned person that the subsequent stages of the metamorphosis take place. For when Gregor listened to her impertinent words addressed to him ("will you take a look at that old dung-beetle") – he never responded, "but [...] stayed just exactly where he was" as if the door had never even been opened. This immobility is the answer for the language which is intentionally adapted to his new figure, the language of words that "she probably thought were friendly" (ibid., p.131), words of vulgar forwardness, that a maiden can address only to some degraded animals from the house where she serves.

In Samsa's attitude, a human reaction of offense is fused with an animal's immobility out of fear. It is the beetle that despises the woman, despite the fact that she is the only one who addresses him personally (if we agree that the questions she is addressing him, although rhetorical, are still questions). "Aren't you coming any closer, then?", she shouted, "intending not to close her mouth until the chair in her hand had been slammed down into Gregor's back." This last convolution of the metamorphosis ends with a short and pointless "brief look in on Gregor". While he is already dead she continues her provocative play with him. Seeing him so still, she considers he is pretending "playing the martyr" as "she attributed all possible understanding to him". Between this recognition of human abilities à rebours (understanding, pretending) and the first sob of the sister, who didn't yet know anything beyond the fact that her brother had a delay for work and didn't want to open the door, a reversal of the inhuman call for rescuing takes place. "[The sister] was clever, she was already in tears while Gregor was still lying peacefully on his back". The friendliness and the alienation must act dialectically. When Gregor decides to show himself to his family he speculates on the following alternative:

"If they were shocked, then Gregor would have no more responsibility and could relax. Whereas if they took it all calmly, then he wouldn't have any cause for agitation either, and if he

hurried, he might still get to the station by eight o'clock" (ibid., p.98). In the first moments of awakening, it seems that nothing beyond this calm is required in order to bring this situation to normality. But Gregor's calm is conditioned by the acceptance both of the family and of the company. So far it was all about the delay and Gregor Samsa was rightly reflecting about why is he "condemned to work for a company where the smallest lapse was greeted with the gravest suspicion?" (ibid., p.93-94). With the coming of the chief clerk in person, the family becomes sucked by the power apparatus played by the employer. It happens so because her being depends entirely on its benevolence. The phonic expression of this betrayal and split in the family was the opening of the door to the chief clerk. "For a moment there was silence. 'They won't open the door,' Gregor said to himself, from within some mad hope caught (befangen in irgendeiner unsinnigen Hoffnung)" (ibid., p.93, my emphasis U.I.). "But then of course, as always, the servant-girl walked with firm stride to the door and opened it" (ibid.). This mad, nonsensical hope is linked to the door and is well defined. It illustrates the hope of the child who hides himself behind the back of his parents when a schoolmaster is chastising him. It is the hope that the petty crimes committed at school won't be sanctioned back home. Alas, from the family's point of view such a decision of keeping the door closed was not only senseless but essentially mad. The door must be open, which is clear for firmly standing down to earth maids and, from then on the bond of confidence between Gregor and his family will be unsealed.

The chief clerk will make the family realize that the voice of Gregor is "the voice of an animal" and instantly pulls them on his side by saying "you don't suppose he's pulling *our* legs, do you?" (ibid, p.98, my emphasis U.I.). Indeed, Gregor Samsa was perhaps not exactly making a fool of everyone, but was expecting this - a "calm" reaction in the house would be foolishness from the point of view of the world. Therefore, since the door has been opened the family has been exposed to a mirror that was reflecting their stultified faces.

Through the opened door of the house and from behind the closed door of Georg the family and its metamorphosis will be subjected to a double observation. As *The Letter to the Father* shows Kafka was a master of looking at things taking into account opposite point of views. Kafka and its characters empathize with the lack of understanding they generate, they are masters of an empathy of alienation – they do not understand themselves as much as it is possible to misunderstand. And they understand others so much that they loose understanding for themselves. This mechanism – of which suicide is the climax – is described in the most concise way in the *Judgment* (Kafka, 2007).

In this novel, the father who has questioned the reality of his son's friend jumps on the bed "kicking up his legs" (ibid., p.47), while in *The Metamorphosis* he was "stamping his feet" unusually high and was "emitting hissing sounds like a savage" (ibid., p.104). It seems that it is on the side of the father that the metamorphosis happens and is instantaneous. From short moments of weakness in which old fathers start to move their sons, grow – so hastily that it is hard to pull oneself together – an inhuman supremacy. It is in terms of this disproportion of forces that the values are ranged. If the son is stately, the father will scream standing on his bed, if he is old and disabled he will throw curses. If the son has been metamorphosed into a beetle, the father will hiss like a wildman and this "sound to Gregor's ears was not that of one father alone" (ibid., p. 105).

The rates of closeness and strangeness are changing in a flash on both sides of the father and of the son. When they fall down to the ground of alienation, they suddenly start to surge with tenderness for the other alien creature. Therefore, a momentary affection for a weak and tired father must withdraw, when he suddenly appears in front of the son "fairly erect; wearing a smart blue uniform with gold buttons" and approaches him with "hands in his pockets [...] with an expression of grim resolve" (ibid., p.124). However, in the realm of rational reflection and practice of everyday life, Gregor Samsa understands his father very well, from the beginning until the end. He is ready to

appreciate his prudence in the house economy, although he discovers how he has been misled. When he flees before his father, he resigns from climbing the walls or ceiling considering that "his father might interpret that as a sign of particular wickedness on his part" (ibid., p.125). This attention toward the father never stops. "[B]ut really, really, was that still his father?" (ibid., p.24). The mills of the metamorphosis help the father to reclaim the prematurely relinquished position of the head of the family. From a retired decrepit old man he returns to his posture from youth who considered it necessary to always be very strict with him. After all, Gregor's metamorphosis helps him to reclaim something that has been for Kafka the most mysterious thing – the care of the *pater familias*.

In the novel under this title Die Sorge des Hausvaters ("The Cares of a Head of Household" Kafka, 2007), a character appears about which the best you can say is, using the words of the cleaner, "that thing" [das Zeug], that is Odradek. Odradek a "flat star-shaped reel of thread" from which a "little rod emerges" and another "rod going off [from it] at right angles" "looks functionless but after its fashion complete" (ibid., p.211). For those who understand Slavonic languages, Odradek sounds like dissuading something to someone (Max Brod and Wilhelm Emrich have written about its etymological link with the Czech rat/rada and "udraditi" meaning disadvise). According to Harold Bloom, "Odradek is uninvited yet will not leave, since implicitly he dissuades you from doing anything about his presence, or rather something about his very uncanniness advises you to let him alone" (Bloom, 2006, p. 17). The etymology suggests dissuading everything relative to it, but also a sort of moving away from, "the prefix od, meaning ab, 'off, away from', and in the suffix ek, indicating a diminutive.... Odradek...would, therefore, mean a small creature that dissuades someone from something, or rather, a creature that always dissuades in general" (Emrich, 1958, p. 92-93). But Kafka at the beginning notices that etymologies both German and Slavonic do not help to explain the meaning of this name. What has brought us close to Odradek is the father who appears in the German title - "Hausvaters". His care leading up to pain consists in the fact that Odradek could survive him and "will [...]one day tumble down the stairs before the feet of [his] children, and [...] children's children" (Kafka, 2007, p. 212). Odradek is not a son but something that seems in rivalry with the father. This conflict around the care of the head of the household family seems fundamental. Its core consists in one mechanism - the rule over closeness and estrangement – on the one hand, the capacity to alienate oneself and to understand alienation of the other, and on the other, an empathy driving one's mad. Kafka has apparently taught oneself to operate those mechanisms perfectly. Living with his father he could never drive any reaction of joy or despair till the end, because the father as a measure of all things appeared and ridiculed both. The father has therefore been the hyper-catalyzer (or rather inhibitor) of Franz Kafka's life. His appearance brings an end to all emotions or experiences in which the son was feeling alive and the life's impossibility has been forgotten. The Letter to the Father is a list of those illusions that vanish at the moment of awakening. It gives us a hint for understanding the father-animal/son relation; the father is the one whose apparent care turns into a fatal repudiation. For the son/animal's will of life, of doing his job no matter the circumstances is paralyzed by its awkwardness within the father's perspective. The call for rescue turns into a rage of depreciation and annihilation.

Why Kafka has not decided to leave his family, why didn't he find deliverance in marriage but, on the contrary, marriage was something that he feared the most? As an answer to such questions can be considered the father's reaction to the announcement of his son's engagement described in the violent scene from *The Judgment*. The way of salvation is blocked by an abasement of both the son and his fiancée. ["because she hoicked up her skirts like this, and like this, the disgusting slut" (Kafka, 2007, p. 47)]. Why this one and not another one? For a mostly ignoble reason – according to the father the inability to meet the sexual needs in a different matter. This systematic and planned humiliation reaches here the only snippet of firm land that has been grabbed

in order to survive. Afterwards, there is no longer any friend, no longer any fiancée because the judgment is impossible to dismiss and is left undismissed.

The father intentionally attacks there where every argument becomes a two-edged sword and suicidally devastates more deeply. In the same way as the son from The Judgment towards the amnesiac father, Cordelia towards her father King Lear does not decide herself to raise the gauntlet that has been thrown down to her feet. They both choose silence: 'Love and be silent'. Nevertheless, the whole oeuvre of Kafka is the study of this silence – it is a postponed fall down, that has been drowned out by a passing bus – a moment of "unending flow of traffic" (Kafka, 2007, p. 50).

#### **Conclusion**

In one of the Zürau aphorisms we discover an alternative that suits our needs and concludes our crossing of philosophy and literature: "You can withdraw from the sufferings of the world – that possibility is open to you and accords with your nature – but perhaps that withdrawal is the only suffering you might be able to avoid" (Kafka, 2006, p.113). Which means that you can withdraw or maintain the distance but no other has been appointed to this task – no one will replace you. This door has been kept open only for you. There is no one else on those sand dunes where a countless swarm of beetles is lying on the back waiting for your salvation.

But equally there is none interspecies bond, there is no way of communicating, there is no natural logic in this rescue. So you may withdraw, you may give an end to your emphatic train of thought, you may find many reasons not to get involved in this beetle affair. Nevertheless, this distance, this indifference – this "foreign thing", according to Gombrowicz would be "the only suffering you might be able to avoid". The hunter Gracchus who is suspended between life and death repeats this judgment:

"[N]o one will come to help me. If people were assigned the task of helping me, all the doors of all the houses would remain closed, all the windows would be shut, they would all lie in bed, with sheets thrown over their heads, the entire earth would be a hostel for the night. And that makes good sense, for no one knows of me, and if he did, he would have no idea of where I was staying, and if he knew that, he would not know how to help me. The thought of wanting to help me is a sickness and has to be cured with bed rest." (Kafka-online.info/the-hunter-gracchus-page4.html)

The metamorphosis effectuates a true displacement in the relationship between man and animal but what Kafka describes is not the transfiguration of man into a beetle but rather the metamorphosis that affects the family. It is the father once small and weak, once monstrous that changes from a caring one to a careless. He is the one who suddenly suspends his interest and becomes indifferent. The suspension of a mad friendliness with a swarm of beetles or one of them who occupies a room of his house is something irrevocable. The reason is that the father not only cannot fully perform his rescue. He cannot even be sure that the alien creature/s is/are suffering. The distance becomes too broad. But the suspension of sympathy, the withdrawal of rescue was the only suffering he could have avoided.

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# Factors determining the utilization of healthcare facilities in a semi-urban setting in Kwara State Nigeria

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#### **Abstract**

**Objectives.** The presence of healthcare facilities alone is not a requisite for the utilization of such facilities, but a function of factors predisposed to end users. This study examined the factors determining the choice of healthcare facility utilization among residents of Eyenkorin in Asa Local Government Area of Kwara State Nigeria. The objective was to identify the most utilized healthcare facility in the studied area and the reasons for choosing to utilize certain health facilities among the participants.

**Material and methods.** Data was retrieved through self and interviewer-administered questionnaire, involving 358 consenting participants that were selected through a two-stage sampling method implying convenience and random sampling techniques.

**Results:** General hospital was mostly utilized by the studied population, representing the option of over one-fourth of the participants (28.5%). This was closely followed by Private hospital (24.6%), Health centers (18.4%), Teaching hospital (10.1%), Spiritual homes (7.8%), Traditional homes (4.5%), Patent medicine sellers (3.9%), and Maternity homes (2.2%). The choice of health facility utilized was informed by effective treatment, quality service, cost, attitude of health workers, professional competence, waiting time, and distance, in that order.

Conclusion and recommendations: The study concluded that distance is not essentially a barrier to healthcare facility utilization. It also concluded that there is a growing trend towards private healthcare facilities utilization among Nigerians when this result is juxtaposed with previous studies conducted in other locations in the country. The study recommended improved healthcare capacity building for government hospitals and provision of health insurance scheme for the people.

**Keywords:** Healthcare Facility, Utilization, General hospital, Private hospital, Health-Seeking-Behaviour.

#### Introduction

Healthcare utilization has been defined by Awoyemi, Obayelu & Opaluwa (2011) as the use of healthcare services by the people. The choice of healthcare facility among people may vary from person to person and from place to place depending on various factors pre-disposed to the end users. Although-good utilization of health services in any society serves to improve the quality of people's health, studies have shown that healthcare utilization by people depends on availability,

quality of service, socio-economic status of the people and personal characteristics of the users (Chakraborty et al., 2005; Manzoor et al., 2009; & Onah et al., 2009).

In Nigeria, the healthcare delivery system is a blend of both public and private healthcare providers. Healthcare provision is the responsibility of the three tiers of government with the private sector also playing along (Akhtaw, 1991). The federal government plays the role of controlling the affairs of the tertiary healthcare system while the state government manages the various secondary healthcare delivery systems and the local government focuses on supervision of primary healthcare services. In the private sector, healthcare delivery is broadly categorized into those that provide primary care (general practitioners), those that provide secondary care, and those that provide both primary and specialist care (Uchendu, Ilesanmi & Olumide, 2013).

Before the advent of modern medicine in Nigeria, traditional medicine was the main system of healthcare delivery. Healthcare delivery services during this time were offered by herbalists, divine healers, soothsayers, midwives, spiritualists, bone setters, mental health therapists, and surgeons (Awoyemi, Obayelu & Opaluwa, 2011). The first record of modern medical services in Nigeria was discovered during the various European expenditures in the early-to-mid nineteenth century, as being provided by doctors brought by explorers and traders to cater for the well-being of the Europeans, while the natives were left to die from their diseases (Chuke, 1988).

However, after more than a century since those European explorers left the shores of Nigeria, the story seems not to have changed. There seem to persist challenges accessing modern healthcare services by the people. A health survey conducted in Nigeria in 2008 revealed that the majority of the people in the country have no health insurance coverage to cater for their health bills (\*\*\*Nigerian Population Commission, 2009), which suggests that a large number of the people in the country pay for their health bills from their pocket (Out of Pocket). This, however, connotes that utilization of healthcare facilities by the people in the country would depend largely on their socioeconomic status, thereby largely informing their choice of healthcare facility utilization.

Studies conducted in and around Nigeria over the years have shown that the choice of healthcare facility utilization depends on the health-seeking behavior of the people and many other factors pre-disposed to the people. For instance, a study carried out in Sagamu, South-West Nigeria, revealed that private hospitals, teaching hospitals, patent medicine sellers, and maternity homes, in that order, were the most preferred type of health facilities due to competence, effective treatment, promptness of service and quality of service (Abiodun & Olu-Abiodun, 2014). A related study conducted in Ilorin, North-Central Nigeria, also revealed that private for-profit health facility was the most preferred healthcare facility, which was informed by the promptness of service and availability of drugs (Abodunrin, et al., 2010).

A further study conducted in South-Eastern Nigeria has also suggested that patent medicine sellers were mostly utilized (Uzochukwu & Onwugekwe, 2004). However, Tanimola & Owoyemi (2009) have found out that cost was a major determinant of health-seeking behaviour of people in Ayangba North Central Nigeria, but Awoyemi, Obayelu & Opaluwa (2011) have argued that the choice of healthcare facility utilization in the area is greatly informed by the waiting time, especially in government-owned hospitals. They argued further that long queues are found in such hospitals, affecting the turnaround time for treatment and complacency on the part of the health workers as a result of having had to attend to many patients daily.

Katung (2001) Chukwuani et al., (2006) Sule et al., (2008) have also suggested that poor quality of services and poor attitude of staff are the major contributing factors responsible for the underutilization of healthcare facilities in developing countries. In addition, the competing nature of traditional medicine and traditional medicine practitioners with that of the modern medicine and medical doctors is also a major concern that is posing a threat to the utilization of modern healthcare

facilities in the country. A survey conducted in Benin City in Edo State, South-South Nigeria in 1998, revealed that, for every signpost that indicated modern healthcare facility in the city, there were also three others that indicated traditional health facility (Awoyemi, Obayelu & Opaluwa, 2011). This suggests that quite a number of people seek medical attention in more of traditional medicine and spiritual homes than hospitals and other modern medical facilities in the country.

Various explanations have been put forward by theorists to explain the determinants of healthcare facility utilization among people. Anderson (1968), for instance, in his Healthcare Utilization Model identified three basic factors that may determine the utilization of health facility by people. The first one he identified is called the propensity factor, suggesting that an individual will likely utilize a health facility if he/she believes that such health facility will be useful for his/her treatment. The second factor called enabling factor includes access to health insurance, family and community support, as well as the location of the individual, while the third factor, called the basic need factor, which entails perception of the need for health services, is socially evaluated.

Rosenstock & Becker (1994) on the other hand came up with the Health Belief Model, which is centered on four basic assumptions. The first assumption suggests that an individual will seek health service if he or she believes he/she is vulnerable to disease. Secondly, health facility utilization depends on the severity of the illness, while the third assumption contends that an individual will seek healthcare service where he/she can get the best service at the minimum cost. However, the last assumption suggests that individuals' choice of healthcare facility utilization depends on influence from friends, family members and the media. It is against this background that this study examines the factors determining the utilization of healthcare facilities in Eyenkorin, Kwara State, Nigeria.

#### **Methods**

The study was conducted in Eyenkorin, a suburb of Ilorin, the capital city of Kwara State, North-Central Nigeria. Eyenkorin is located in Asa Local Government Area of Kwara State, one of the sixteen Local Government areas of Kwara State. The town is bordered by Ilorin city and Afon, the headquarters of Asa Local Government. It is a nodal town that links some part of the South-West Nigeria with Northern Nigeria. The town is inhabited by settlers from various cultures, mostly from the Yoruba, Hausa, and Ibo tribes' majority of who are from the Yoruba tribe. A large number of the inhabitants are traders, trading in consumables and engaging in other petty trading, while others engage in peasant farming and transport business. The settlement is about five minutes' drive from the center of the city of Ilorin. It is a dispersed settlement with many houses located far apart from one another and littered with shops. Eyenkorin has one district health center, two clinics and maternity homes (<a href="http://kwarastate.gov.ng/asa/">http://kwarastate.gov.ng/asa/</a>). There is also a number of patent medicine stores scattered around the town.

A total of 358 consenting participants from the age of 18 years and above were involved in the study. The study employed a two-stage sampling method, which involved first convenience sampling technique and thereafter random sampling of participants. Information was gathered through a self-administered questionnaire for the participants who are literate and interviewer-administered questionnaires for those participants who are not literate. Four research assistants were recruited to administer the questionnaires and to explain the content of the questionnaire to the participants for clarity. The questionnaire contained questions on participants' socio-demographic factors, participants' healthcare facility most utilized and participants' reasons for utilizing a particular health facility. Data retrieved from the field was analyzed using the Statistical Package for Social Science (SPSS 17.0), while results were presented with tables and simple percentages.

# Results

**Table 1. Socio-Demographic Factors of Participants** 

Table 1. Socio-Demographic Socio-demographic variable		Percentage (%)
Sex		
Male	212	(59.2)
Female	146	(40.8)
Total	358	(100.0)
Age in years		
18-20years	52	(14.5)
21-30years	170	(47.5)
31-40years	58	(16.2)
41-50years	64	(17.9)
51-60years	14	(3.9)
Total	358	(100.0)
Marital Status		, ,
Single	68	(19.0)
Married	272	(76.0)
Widowed/ Divorced	18	(5.0)
Total	358	(100.0)
Religion		
Christianity	66	(26.8)
Islam	262	(73.2)
Total	358	(100.0)
Occupational Status		
Unemployed	22	(6.1)
Self-Employed	208	(58.1)
Professional	18	(5.0)
Skilled Labour	64	(17.9)
Unskilled Labour	46	(12.8)
Total	358	(100.0)
<b>Educational Status</b>		
None	72	(20.1)
Primary	67	(18.7)
Secondary	192	(53.6)
Post- Secondary	11	(3.1)
Tertiary	16	(4.5)
Total	358	(100.0)
Tribe		, ,
Yoruba	324	(91.0)
Ibo	3	(0.8)
Hausa	16	(4,5)
Tiv	5	(1,4)
Others	10	(2.3)
Total	358	(100.0)

Researchers' Survey 2016

**Table 2: Healthcare Facility Most Utilized by Participants** 

Healthcare Facility	Frequency	Percentage (%)
General Hospital	102	(28.5)
Private Hospital	88	(24.6)
Patient Medicine Sellers	14	(3.9)
Health Centers	66	(18.4)
Teaching Hospital	36	(10.1)
Spiritual Home	28	(7.8)
Maternity Home	8	(2.2)
Traditional Homes	16	(4.5)
Total	358	(100.0)

Researchers' Survey 2016

Table 3: Reasons for utilization of health facility

Reasons for Utilization	Frequency	Percentage (%)
Effective Treatment	96	(26.8)
Quality Service	78	(21.8)
Cost	72	(20.1)
Attitude of Health Workers	34	(9.5)
Professional Competence	30	(8.4)
Waiting time	30	(8.4)
Distance	18	(5.1)
Total	358	(100.0)

Researchers' Survey 2016

Table 1 shows that 59.2% of the participants were male, while 40.8% were female. 47.5% of the total sample was within the age bracket of 21-30 years. Consequently, 76.0% are married, while 19.0% of the studied population was single and 5.0% are widowed. Furthermore, 26.8% of the participants were Christians, while 73.2% were Muslims. In addition, 58.1% were self-employed, 17.9% were skilled laborers, 12.8% were unskilled laborers, 5.0% were professionals, while 6.1% were unemployed. Regarding the educational status of the participants, 20.1% had no formal education, 18.7% had only primary education, 53.6% had secondary school education, and 3.1% had only post-secondary education, while 4.5% of the participants' have tertiary education. As regards tribal affiliation, sample distribution was the following: Yoruba tribe (91.0%), Hausa tribe (4.5%), Tiv tribe (1.4%), Ibo tribe (0.8%), and other minor tribes (2.3%).

As displayed in table 2, the utilized healthcare facilities were: general hospital (28.5%), private hospitals (24.6%), patent medicine stores (3.9%), health centers (18.8%), teaching hospital (10.1%), spiritual homes (7.8%), maternity home (2.2%), and traditional homes (4.5%).

According to table 3, 26.8% of the participants made their choice of health facility based on the effectiveness of treatment; other reasons were as follows: quality of service (21.8%), cost (20.1%), attitude of health workers (9.5%), professional competence (8.4%), little waiting time (8.4%), and distance from their home (5.1%).

#### **Discussion**

The study has been able to assess the options for using certain health facility services among the participants and the reasons behind their choices. Result, however, showed that the most utilized healthcare facility among residents in the studied area is the General hospital situated in Ilorin and Afon, representing over one-fourth of the participants. This was closely followed by the Private hospital accounting for about one-fourth of the participants while Health centers, Teaching hospital, Spiritual homes, Traditional homes, Patent medicine sellers and Maternity homes followed, in that order. The choice of health facility among the participants was informed by effective treatment, quality service, cost, the attitude of health workers, professional competence, waiting time, and distance in that order.

These findings are, however, not in agreement with those reported in the earlier study conducted by Abodunrin, et al. (2010) in Ilorin, North-Central Nigeria, that showed that private-for-profit health facilities were the most preferred healthcare facilities by the people. In addition, the findings of this study come to contradict the results of the study carried out by Abiodun & Olu-Abiodun-(2014), in Sagamu South-West Nigeria, which found out that a private hospital was more preferred by the people. The current study revealed that people are gradually turning towards private healthcare facilities and that distance is not necessarily a barrier to healthcare facility utilization if people consider that they will get good treatment for their illness.

#### **Conclusion and recommendations**

The study examined the factors determining the utilization of healthcare facilities in Eyenkorin, a suburban community in Asa Local Government Area of Kwara State, North Central Nigeria. 358 consenting participants from 18 years and above were included in the study, being conveniently and randomly sampled from the studied population. Primary data were retrieved through a self and interviewer-administered questionnaire that contained both open and closed questions. Results showed that the most utilized healthcare facility among the respondents is the General hospital in the neighboring towns of Afon and Ilorin, which was closely followed by the private hospital. According to the study, participants' choice of health facility was informed by effective treatment, quality service, cost, the attitude of health workers, professional competence, waiting time, and distance, in that order.

The study revealed that distance is not essentially a barrier to healthcare facility utilization; it also revealed that there is a growing trend towards private healthcare facilities as a choice of medical services among the people of Nigeria, a result also supported by previous studies conducted in other locations in the country. The study, therefore, recommends that government should improve capacity building for the government hospitals by equipping them with updated armamentarium to meet the current health needs of the people. It also recommends that government hospitals should reduce the bureaucratic process to the barest minimum to avoid delay in delivering medical services, since waiting time is an important factor influencing the use of healthcare facilities, especially in government owned hospitals, such as general and teaching hospitals and primary health centers. Finally, the government should make health insurance available to the people by subsidizing their health bills and thus reducing the financial burden on individuals.

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# CRANIOLOGICAL SERIES FROM THE GRAVEYARD AROUND THE "40 HOLY MARTYRS" CHURCH

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#### **Abstract**

**Objectives.** This study examines the anthropometric characteristics of the cranial series from the necropolis around the "40 Holy Martyrs" that dates back in the second half of the 13th -14th c. AD, revealing new data about the population of the capital of the second Bulgarian Kingdom.

**Material and methods.** Determination of the morphological characteristics of the studied population was based on craniofacial anthropometry. The measurements were performed using the standard spreading caliper with scale. The analysis is concentrated on the male series.

Results and conclusion. Cranial index (mean value – 78.25) describes the series as mesocranial, a result supported by the distribution of its values. Brachycranial and hyperbrachycranial skulls represent 23.1 % of the studied population, while dolichocranial ones – 15.4 %. The length-height index (M = 73.1, orthocranial) presents a distribution of values with most cases included in the orthocranial rubric (76.9 %). Distribution of high breadth index and correlations with the height, from the *porion* show high variability. Facial profile is orthognathous (one strongly divergent skull). Faces are relatively broad, considering the mean value of the facial index (84.4, euryprosopic), but its distribution has 44.4 % euryprosopic faces, while in 22.2 % of the cases the length prevails (determining leptoprosopic faces). The use of the Virchow's method increases the proportion of faces for which the height is predominant. The latter results are confronted with those obtained for the upper face height. Orbital index describes the series as mesoconch, nasal index divides it equally between the chamaerrhine (broad nose) and leptorrhine (narrow nose) categories. Scarce data existing for the females point to a rather homogenous structure of the series.

**Keywords:** craniofacial anthropometry, medieval necropolises, Second Bulgarian Kingdom

#### Introduction

The current study aims to describe the anthropometric characteristics of the cranial series from the necropolis around the "40 Holy Martyrs" Church in Veliko Tarnovo, but also to compare the obtained results with the ones reported by some previous investigations conducted upon the osteological material found in the medieval necropolises of Bulgaria – from Bojenishki Urvich, Chirakman, Kavarna, Kabile, Pernik, Perperikon, and Tatul to name a few).

For the same purpose of revealing new data about the population living in the capital of the second Bulgarian Kingdom, it was used the comparative analysis of the Bulgarian series with some craniological series of the Late Middle Ages from Romania (Wallachia region).

#### **Material and Methods**

The necropolis situated around the church of "40 Holy Martyrs", dates back in the second half of the 13th -14th c. AD (Тотев и съавт. 1996, 2001, 2002, 2003, 2004, 2005) and represents a population from the flourishing period of the capital city of the Second Bulgarian Kingdom. This was a political, trade, religious and cultural centre of high importance for that period in the Balkans. Developing around the royal court church, the necropolis brought together corporeal remains from the members of the upper social strata of the medieval society in the town.

Sex identification of those buried there was done based on the available material from skeletons, using macroscopic methods (summarized in: Acsadi and Nemeskeri 1970, White and Folkens 2005, Walrath, Turner and Bruzek 2004) with priority being given to the results obtained from the features of the pelvic bones. Age of the adult individuals was determined by assessing the symphyseal surface of pubic bones (Todd's scale in: Schwartz, 1995), iliac auricular surface (Ubelaker 1989) and cranial sutures obliteration after timings in Olivier and Simpson (in: Алексеев, Дебец 1964), compared to the scales of Meindl and Lovejoy (1985). Metrical data are correlated to standard tables for diameters of femoral, humeral and radial heads, femoral and humeral bicondylar breadth (used in: Bass, 1971, and Kühl, 1985). The craniometrical study is done using the methods of Martin and Saller (1959). The analysis also included methods for the assessment of horizontal profile of the face considering the zygomaxillary angle and depth of the canine fossa (Алексеев, Дебец 1964). The material is highly destroyed. Most affected area appeared to be the facial part, which in many cases was lacking some of the measurements. Skulls often lacked their cranial base. The vertical profile was assessed by measuring the angle between length of the face and upper face height, derived using cosine theorem from linear measurements between length of the cranial base (basion-nasion), length of the facial section (basion-prostion) and upper face height (prostionnasion). Choice of this angle was made according to the available equipment. Intervals of values variation for this angle were defined after an analysis of the statistical graphics of their distribution and deviation from normal distribution. Highly diverging values (obtained from skulls from graves № 29 and 99 – excessively low and from grave № 51 – high values) are excluded in obtaining the normal distribution. So, the maximal (81.37°, skull from grave № 91) and minimal (71.94°, skull from grave № 85) values of the angle and between them – two intervals 71° up to 76.25° (mean, including the mean for the series) and 76.26° up to 81.5° (high) were defined. Values under 71° were appraised as low and those over  $81.6^{\circ}$  – as very high. The fragmentary state of the material also suggested intergroup analysis of hard palate proportions using length between the craniometrical point orale to palatine suture instead of hard palate length. Based on the obtained measurements, five categories were defined, following the same procedure as described for the previous measurement. Highly deviating values from normal distribution were recorded in individuals from grave № 140 and 245 (excessively high) so that they were excluded from the normal distribution. After this procedure, maximal, 116.92 (skull from Grave № 228) and minimal, 71.43, (Grave № 202) values were defined and between them – three intervals, as follows: 69-84.999, 85-100.999, and 101-116.999, respectively, of low, mean (including the mean and the median for the series) and high values. Values under 69 were theoretically defined as very low, without any observed case, while values over 117 were considered very high – they remain in the category "over 117 – very high".

### **Results and discussions**

**Table 1.** Mean values of basic skull measurements, for males and females

Dimension		Measurements		Males		Females			
Dilliciisioii	No	Landmarks	N	M	σ	N	M	σ	
Neurocranium									
Maximum cranial length	1	g-op	41	184.96	1.12	6	176.33	3.58	
Maximum cranial breadth	8	eu-eu	41	145.01	0.97	4	143.25	0.75	
Cranial height (Basilo-	17	ba-b	28	134.55	1.18	3	133.83	4.51	
Bregmatic Height)									
Cranial height (porion)	20	po-b	39	114.41	1.94	6	109.03	7.23	
Minimum frontal breadth	9	ft-ft	52	98.55	0.75	7	96.07	1.68	
Occipital breadth	12	ast-ast	40	113.29	0.82	6	106.25	1.49	
Cranial base length	5	ba-n	22	103.64	1.46	3	95.83	4.69	
Facial part									
Facial length	40	ba-pr	14	98.62	2.51	2	89.00	8.00	
Maximum Bizygomatic Breadth	45	zy-zy	11	133.27	2.23	2	127.25	2.25	
Upper facial breadth	43	fmt-fmt	27	105.51	1.04	5	101.10	1.85	
Zygomaxillary breadth	46	zm-zm	28	96.48	1.19	4	90.00	1.81	
Total face height / Morphological Facial Height	47	n-gn	16	114.97	2.61	3	112.83	3.44	
Upper face height	48	n-pr	29	68.76	1.05	3	66.67	3.53	
Nasomalar angle	77	fmo-n-fmo	6	142.6	3.65	3	17.00	0.29	
Zygo-maxillary angle		zm-ss-zm	20	125.5	1.51				
Facial length-height angle	-	ba-pr-n	15	75.3	1.4	2	77.9	-	
Orbital breadth	51	mf-ect	31	41.70	0.49	4	42.25	0.85	
Orbital height	52		30	33.20	0.35	4	36.13	0.52	
Nasal height	55	n-ns	29	51.83	0.70	3	50.00	2.89	
The maximum breadth of the pyriform aperture	54	al-al	25	26.47	0.62	3	24.33	1.20	
Piriform aperture height	55.1	rhi-ns	9	34.50	1.55				
Dakrial breadth	49.a	d-d	19	23.37	0.59	3	22.33	1.20	
Dakrial height	DS		17			1	11.00	-	
Nasal bones breadth	57		17	10.56	0.89	2	7.50	2.50	
Nasal bones length	56	n-rhi	10	25.55	1.53				
FC			40	5.33	0.28	8	3.69	0.28	
Alveolar process height	48.1	ns-pr	34	17.88	0.68	7	15.07	0.87	
Palatal breadth	63	enm-enm	35	36.53	0.62	7	35.26	0.76	
Palatal anterior length			35	38.07	0.74	7	36.50	1.14	
Palatal length	62	ol-stph	25	47.18	1.01	5	43.20	1.97	
Mandible									
Symphysial height	69	id-gn	46	32.32	0.57	9	28.27	0.67	
Breadth at mental foramen	69.3		47	11.80	0.30	10	10,.05	1.18	
Angle breadth (Bigonial Breadth)	66	go-go	33	102.31	0.87	6	96.17	1.74	
Mental breadth	67	ml-ml	12	46.33	0.93	3	46.50	1.04	
Projection length	68		38	81.54	1.45	6	68.83	4.70	
Branch height	70		34	61.84	1.28	8	59.50	2.48	
Branch smallest breadth	71		42	31.99	0.45	8	29.28	0.98	
Mandible angle (Angle of the Lower Jaw)	79		40	122.98	0.97	7	123.00	3.10	

Craniological series includes mostly male skulls, while females are presented in single finds (Table 1). For this reason, the analysis of the obtained results concentrates upon the male series. The descriptive statistical analysis of the main indexes of the neurocranium shows that the series is a mesocranial one (mean value of cranial index was 78.25). Distribution of this index values into categories supports this result with 61,5 % mesocranial skulls (Table 2). Meanwhile, a high degree of the brachycranisation process is observed, with 23.1 % of brachy- and hyperbrachycranial skulls. 15.4 % of the skulls are dolichocranial. These results find an interpretation in two directions – one as a result of investigation of a heterogeneous population, and second, as a consequence of the brachycephalization process. The height-length/vertical index shows a distribution pattern of values closer to the mean of the series (M = 73.1, orthocranial, SEM = 0,693) with 76.9 % of the skulls falling within the limits of the orthocranial category (Table 2). The height-breadth index and height-length and heigh-breadth indexes, with height measured from *porion* (*po*), show high variability regarding the distribution of values into the basic categories.

**Table 2.** Distribution of values and means of the main indexes of cerebral section of the skull, males and females

0.1	Skull Index, 6:1	laics	N	dolichocr anial	mesocra nial	brachycrani al	hyperbrachycr anial	ultrabrachyc ranial	M	σ
;	ex,	M	39	6	24	5	4	-	78.25	0.6
	ına	%		15.4	61.5	12.8	10.3	-	meso-	
=		F	4		2	1	-	1	82.55	2.8
212	) K	%			50.0	25.0	-	25.0	brachy-	
<b>y</b>			N	chamaec ranial	orthocra nial	hypsicra nial			M	σ
Height-length index		M	26	2	20	4			73.1	0,7
ı in	17:1	%		7.7	76.9	15.4			ortho-	
ıgt	ba,	F	3			3			76.81	0.9
-ler	q	%				100			hypsi-	
]	I	M	37	5	11	21			61.9	1.1
leig	20:1	%		13.5	29.7	56.8			ortho-	
1	po, '	F	6	1		5			62.13	4.6
	d	%		16,7		83.3			ortho-	
X			N	tapeinocr anial	metriocr anial	acrocranial				
nde	8	M	27	10	11	6			93.6	1.1
h i	17:8	%		37.0	40.7	22.2			metrio-	
adt	ba,	F	3	1	1	1			93.64	3.7
bre	q	%		33.3	33.3	33.3			metrio-	
Height-breadth index	8	M	38	19	13	6			78.9	1.3
ei ei	20:8	%		50.0	34.2	15.8			tapeino-	
H	po, 2	F	4	1	3				80.0	1.7
	D	%		25.0	7.,0				metrio-	

8:1 – correlation of measurements, numbered by Martin, Saller (1959)

The obtained results describe the facial section of the series as orthognathous, based on the jaw index, with a mean of 96.3 corresponding to 71.4 % orthognathous skulls (14 individuals) (Table 2). Values of this index for three skulls (21.4 %) fall into the category of mesognathy and only one is prognathous (7.1 %). Only nine skulls allowed calculation of the facial index -M = 84.4, euryprosopic (Table 3). Its distribution is highly heterogeneous with 44.4 % relatively broad faces, while in 22.2 % of the skulls the height measurement prevails (with 11.1 % in each category of lepto- and hyper- leptoprosopic). The facial index, calculated by the Virchow's method, with

middle face breadth (between zygo-maxillary points), includes more material (14 skulls). Based upon it, the proportion of faces with predominance of breadth measurement increases up to 57.2% (hyperchamaeprosopic and chamaeprosopic), but the distribution of the values in the series remains heterogeneous. Values of both latter indexes are highly influenced by the reconstruction with the lower jaw, which varies according to dental attrition, fixation in occlusion, different irregular bites, post-mortal deformation, massiveness of the skulls affecting in different degree the height of the lower jaw and eventually the face height. Nevertheless, the results of the analysis carried out on these indexes, obtained with the upper face height, draw a similar picture. Upper-face index is measured for 11 skulls and presents a mean value of 51.7, falling into the mesen category, represented by 54.5 % of the investigated skulls. The second place of occurrence in the distribution of skulls after the upper-face index belongs to those with predominance of the breadth measurement, 27.3 %, (3 skulls).

Table 3. Distribution of values and means of main indexes of facial section of skull, males and females

N   hyper-curyprosopic   curyprosop   curyprosop   curyprosop   curyprosop   curyprosop   curyprosop   curyprosopic   curypr	iciliaics									
N			N			_			M	σ
Second   S		M	9				1		84.4	2.7
Second   Fig.   Fig.   Second   Secon	. 10			33.3	11.1		11.1	11.1		
No.   Section   Section	ace   7:4;7	F	2	-	1	1		-	87.0	2.2
Second   S	Face Fa	%		-	50	50	-	-	meso-	
Note					euryen	mesen	lepten			
Note	ace		11			6	2		51.7	1.0
Note	erfa 5				27.3	54.5	18.2			
Note	Jpp 4:7:		2		1				51.8	3.8
N	J 4	%					50,0		mesen	
Second   S					-	_			M	σ
Single State   State	3		14		4				118.6	3.0
Single State   State	rhc: ., 6			28.6	28.6		21.4			
Single State   State	r <i>Vi</i> 'ace 7:4		3	-						3.7
Single State   State	fter F					66.7				
Standard   Continger   Conti	A		23			X				1.3
Standard   Continger   Conti	r-fa			8.7		-				
Standard   Continger   Conti	3pe		3	-		-				2.3
N	1.0 4.8	%		-					chamae-	
N   Camae-conch   Conch   C						_			M	σ
N     Camae-conch   Conch	<b>i</b> :	M	14		10	3	1		96.3	2.4
N     Camae-conch   Conch	40	%			71.4	21.4	7.1		ortho-	
N     Camae-conch   Conch	aw,		2						89.74	2.6
N	Je	%				100			meso-	
N   leptorrhine   mesorrhin   chamaerrh   hyperchama   mesorrhin   e   ine   erhinae   M   o	51	N							M	σ
N   leptorrhine   mesorrhin   chamaerrh   hyperchama   mesorrhin   e   ine   erhinae   M   o	52::	M	30						79.8	1 1
N   leptorrhine   mesorrhin   chamaerrh   hyperchama   mesorrhin   e   ine   erhinae   M   o	, <u>f</u>		30		· ·					1.1
N   leptorrhine   mesorrhin   chamaerrh   hyperchama   mesorrhin   e   ine   erhinae   M   o	bita		4		23.3	L				1.2
N   leptorrhine   mesorrhin   chamaerrh   hyperchama   mesorrhin   e   ine   erhinae   mesorrhinae   mesorrhinae	Or		<u> </u>							1.2
M   22   9   4   8   1   51.3   1.9	10				lantarrhina mesorrhin chamaerrh hyperchama			σ		
N	4:5	M	22		9				51.3	1.9
N	1, 5,				_		_	_		1.7
N	asal		3		1					1.9
N     lepto-   meso-   brachy-   staphyline   staphyline   staphyline	ž				33.3	_	_	-		
70 30 30	62		N		lepto-	meso-	brachy-			
70 30 30	63:	M	20							
70 30 30	al,									
70 30 30	ılatı		4							
	Pa									
			N				high	very high	M	σ
		M								
한 글 % 2.,8 35.5 32.3 6.5 medium	rioi al									
$\frac{9}{5} = \frac{1}{5}$ F 7 5 2 - 97.1 3.4	nte lat	F	7							3.4
✓ ½     %       71.4     28.6       -     medium	- <del>-</del> -						_			

Most of the material allows calculation of the upper-face index according to Virhow's method (Table 3). Results of this index confirm the prevalence of relatively high faces in the series, but not as pronounced, as shown by the distribution of the values of the upper face index. Following Virhow's method, 23 skulls of males were measured, from which 14 (60.9 %) fall in the category chamaeprosopic and hyper-chamaeprosopic as the mean value was 72.1. The distribution of the obtained values shows a relatively high portion of skulls with the predominance of breadth measurement (39.1 %, or 9 male skulls and two out of the three measured female skulls).

The orbital index (Table 3) is obtained in 30 cases. Its values point to the non-homogeneous character of the series. Mean value of 79.8 falls into the mesoconch category, where 60 % of the skulls are included. In 23.3 % of the cases (7 skulls), the breadth measurement (chamaeconch) predominates and 16.7% from the orbits (5 skulls) are described as high (hypsiconch).

Nose index is established for 22 skulls and divides the series between both categories of leptorrhine (predominance of high measurement and narrow proportions) 40.9% (9 skulls) and chamaerrhine (wide nose, with predominance of breadth measurement) 40.9% (9 skulls) (Table 3). Only 18.2 % of the cases and the mean value fall in the mesorrhine category.

When considering the palatine index, the skulls with the leptostaphyline form of the hard palate (60.0 %) prevail. Scarce data for females present a more homogenous structure (Table 1-5).

As the jaw index, angles of face profile describe the faces as intensively profiled (Table 4). Canine fossa in most cases is of medium to deep profile (Table 5).

males a	nd fe	males	S					
		N	very small	small	medium	big	M(°)	σ
Ľ	M	20	8	8	3	1	1255	15
)- illa	%		40.0	40.0	15.0	5.0	small	-
Zygo- maxillary	F	3	-	3	-	-	128.8	0,.6
Z	%		-	100.0	-	-	small	
1)		N	small	medium	big	very big	M(°)	σ
n- face	M	15	2	7	5	1	75.3	1.4
ngth- ght f gle,	%		13.3	46.7	3.,3	6.7	medium	
25 E	Б	2		1	1		77.0	2.0

**Table 4.** Distribution of values and means of the main angles of horizontal and vertical profile, males and females

Table 5. Measurements of canine fossa

		N	very shallow	shallow	medium	deep	very deep	M	σ
	M	40	1	16	12	7	4	2.93	0.2
ine a	%		2.5	4.,0	30.0	17.5	10.0	very shallow	
'anir	F	8	=	7	1	-	=	2.2	0.1
C	%		=	87.5	12.5	-	=	very shallow	

Cranioscopical analysis was carried out on highly fragmented finds (Table 6). Development of the relief in the supra-orbital region and *glabella* was evaluated according to *Broca's scales* (in: Απεκcees, Дεбец, 1964). Both anthropina (61 cases, 67.8 %) and *fossa praenasalia* were recognized in the form of the lower margin of the nose aperture. Based on the development of the feature, the latter was divided into two degrees – the first, slightly developed, where the lower margin is smoothened, the outline of both fossae is not sharply pronounced (16 cases, 17.8 %) and, the second, fully developed, in which both fossae have clear outline (13 cases, 14.4 %). The development of the marginal tubercle of the zygomatic bone was also classified into

three categories: the absence of any trait category, the trait development category, with protuberance on the zygomatic process, and the highly developed trait category, with pronounced mass on the lateral side of the zygomatic process. The absence/presence of the metopic suture on the frontal bone and ossicles in cranial sutures were registered in the description of the individual anatomical variation. Sex distribution of the relief in the supraorbital region and marginal tubercle was obtained only from skeletons, whose sex was independently determined considering more than one feature of the pelvic bones. The statistical regression method showed significant sexual dimorphism in the development of these traits. In opposite, no connection between sex and the distribution of metopic suture and Inca bones was ascertained. Metopic suture appeared in 10.6 % of cases, (10 skulls), Inca bones – in 44.2 % of cases, with different localizations and various prevalence on one skull. Data for lateralization of the trait were scarce, but indicated no such tendency. *Os intraparietale* (ossicle in the sagittal suture) was found on one skull, combined with *Inca bone* (Grave № 163, male) and in one – *os epiptericum*, at left side (Grave № 129, male).

**Table 6.** Development of cranioscopical traits, for males and females

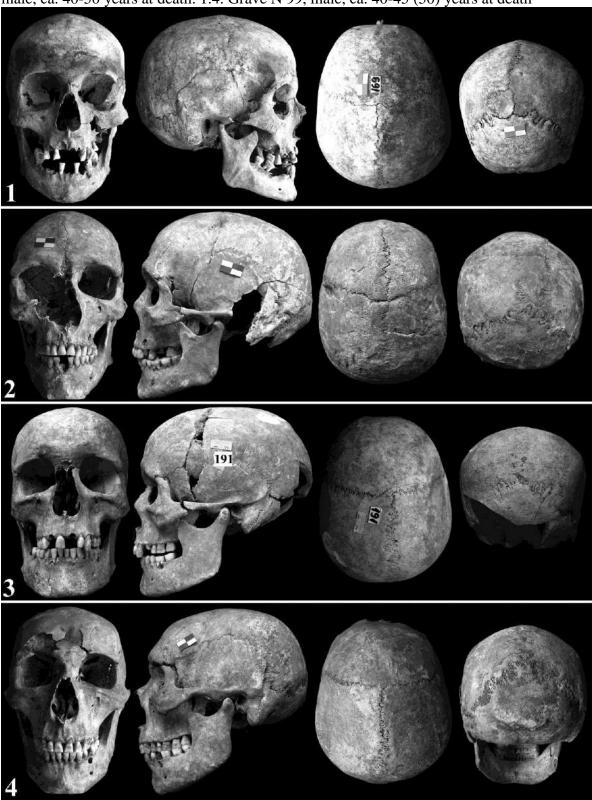
<u> </u>	l	M		F		1	M		F	ı	N	Л		F
Supraorbital relief (degree)	N	%	N	%	Glabella (degree)	N	%	N	%	Tubercullum marginale	N	%	N	%
0	-	-	1	8.3	0	-	-	2	16.7	absent	4	10	3	33.3
1	8	10.5	10	83.3	1	1	1.3	7	58.3	developed	4	10	3	33.3
2	55	72.4	1	8.3	2	17	22.4	3	25	pronounced	32	80	3	33,3
3	13	17.1	0	0	3	38	50	0	0					
					4	18	23.7	0	0					
					5	2	2.6	0	0					
Tt	26	-	12	-	Tt	26	-	12	-	Tt	62	-	9	-

Even though the small number of individuals in the series does not allow a statistical confirmation of the obtained results, some groups of skulls with close craniological features can be defined in the investigated series. When considering the remaining complex of the craniological features (Table 7, Figure 1), three different groups can be recognized among the mesocranial skulls. The first one, which includes 12 skulls (from Graves № 36 II, 141, 144, 169, 176, 223, 233, 251, 264, 279), appears more homogenous. The incomplete skulls in Graves № 253 and 269 with the indexes of the facial part resemble this group by virtue of the indexes calculated for the facial part. The height indexes of the neurocranium describe relatively high skulls, respectively - hypsi and acrocranial (with heights from basion), and high and average-high skulls, ortho- and acrocranial, (according to porion heights). Within this group, the main indexes of the facial section of the skulls show very close values. The upper face index describes them as chamae-, (one case of hyperchamae-) prosopic, with average to high breadth. Midface profile angle is small, orbits, described by orbital index, are from medial high to high, (mesoconch in five cases and hypsiconch in two cases), and the nose index, found in only two skulls, falls into the category of chamae- and mesorrhine. The lower margin of the nose aperture is formed as anthropina (11 cases) with one exception of fossa praenasalia. The dakrial index, depth of fossa canina and palatal index show diverse values.

Other 11 mesocranian skulls (from Graves  $N_{\underline{0}}$  96, 99, 100, 111, 203, 206, 215, 217, 226) are grouped by their close values of the upper face index, which describes them as *leptoprosopic*, of the orbital index – with values in the category of mesoconch (six cases), one exception of

hypsiconch type, narrow nose, leptorrhine (five cases) and form of the lower margin of the nose aperture as fossa praenasalia (one exception – anthropina). Vertical profile of the upper face is obtained in three cases. Values are low to medium, or 67.05° (Grave № 99), 73.14° and 74.99° (Graves № 215 and 226 respectively). Same skulls show jaw index with values in the mesocategory. Dakrial index has medium to high values, fossa canina is shallow, palatal index has values in the lepto- category (three cases) and one – mesostaphyline. Values of the height indexes with measurement from basion, fall in the categories which describe medium high skulls – ortho- and methriocranial, with one exception, out of seven cases, of hypsicranial, relatively high skull. According to the height-length and -breadth indexes, skulls from this group are divided in rubrics of tapeino- and metriocran (three and four skulls, respectively). According to the height- and breadth-length indexes with measurement from porion, and depth of fossa canina, the skull from grave № 216 can be ascribed to this group. Other feature – the form of the lower margin of nose aperture, anthropina, is not as characteristic for this group. Indexes that describe the facial section of the skulls from the Graves № 221 and 237 are similar to this group, but their preservation state does not allow description of the cerebral part.

**Figure 1.** Skulls, mesocranial group, frontal, lateral, vertical and occipital view. 1.1. Grave N 169, female, ca. 45-50 years at death. 1.2. Grave N 100, male, ca. 55-60 years at death. 1.3. Grave N 191, male, ca. 40-50 years at death. 1.4. Grave N 99, male, ca. 40-45 (50) years at death



The skull from Grave  $N_{2}$  99, having a high-breadth index (with both measurements from *basion* and from *porion*), which describes it as low, expresses alveolar prognathism of the vertical profile and deviates from this group and from the whole craniological series, remaining an exceptional case among this population.

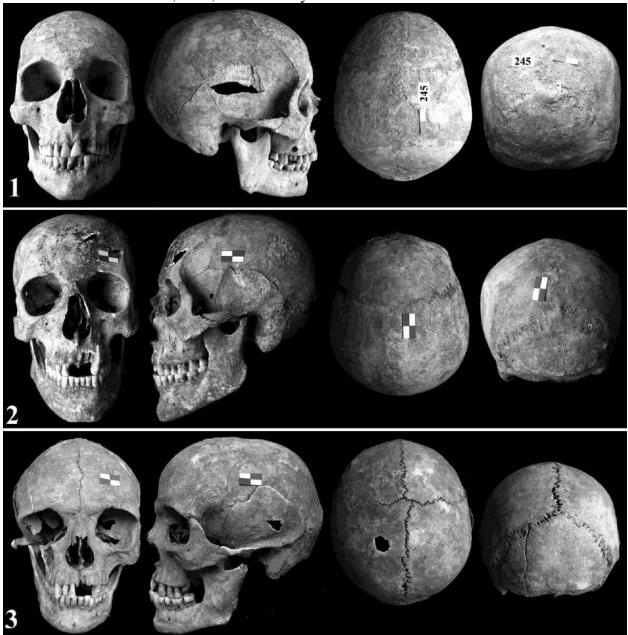
The third group of the skulls with cranial index in the mesocranial category (from Graves № 4, 38, 166, 191, 202, 232) looks homogenous as regards the values of height-breadth and -length indexes of the cerebral section in the categories of ortho- and metriocranial. According to the height from *porion*, they have more often a low form in height-breadth and -length index. In this group, the form of the lower margin of the nose aperture is appraised as *anthropina*, the jaw index falls into the category of orthognathous, the values of the vertical upper-face index are medium to high, grouped around 75.74°. The remaining indexes of facial section show lack of homogeneity – two cases of chamae- and one hyperchamaeprosopic and one case of leptoprosopic, two cases of meso- and by one chamae- and hypsiconch after the orbital index, two cases of meso- and one hyperchamae- and one leptorrhine after the nose index. Similar distribution is to be seen in the values of dakrial index. The canine fossa is from medium to very deep, both cases, which allowed calculation of palatal index present values in the leptostaphyline category.

**Table 7.** Mean values of measurements and indexes in the defined groups, male and female combined

		mesa	ocranial 1	mesocranial 2		mesocrania <del>l</del> 3		brachycranial		hyperbrachy cranial		dolichocrani al	
		N	Mean	N	Mean	N	Mean	N	Mean	N	M	N	M
	Skull	10	77.22	9	77.79	6	76.80	5	82.20	4	86.24	6	73.43
	Height- lenght	5	78.32	6	73.26	6	72.89	3	72.08	2	71.56	3	72.42
	from po	9	65.19	7	62.73	6	53.30	5	65.70	4	66.00	6	58.89
	Height- breadth	5	101.09	6	93.6	6	94.92	3	88.51	2	82.67	3	97.78
es	from po	9	84.40	7	80.87	6	69.45	5	79.94	4	76.54	6	80.19
Indexes	Upper- middle face	6	68.81	4	76.44	4	70.58	2	86.32	1	94.81	2	95.76
	Jaw	1	87.10	2	94.63	5	93.89	3	67.95	1	80.43	2	74.97
	Orbital	7	82.41	6	81.18	4	81.61	3	84.62	3	78.53	4	75.71
	Nose	5	51.61	4	45.99	4	50.89	2	50.31	3	46.48	2	49.68
	Dakrial_	3	45.13	2	51.41	3	51.67	4	84.07	2	79.36	0	
	Palatal	5	86.37	3	75.37	2	67.15	2	55.95	4	44.68	1	53.85
nent	Jaw angle	1	80.79	2	74.04	5	75.74	2	81.64	1	74.93	2	75,.0
Measurement	Middle face angle	5	127.20	3	129.00	2	123.50	2	127.75	1	140.00	2	127,.0
Me	Canine fossa	11	5.36	5	3.30	3	6.57	4	4.00	3	3.83	6	6.17
	The lower edge of the pyriform aperture	12	Anthro- pina (91,7%)		Fossa		Anthr- opina	12	Anthro- pina fossa prae- nasalia				Anthro- pina (80 %)

One group of individuals has a brachycranic index of the skull (graves № 51, 129, 146, 205, 245), medium to low cerebral section, mostly considering the length-breadth index and facial section of chamaeprosopic (three skulls). The orbits have a medium (two cases) to prevalent height (one case). The nose aperture is medium narrow to narrow with lower margin formed as *anthropina*, or *fossa praenasalia*. In the group of skulls with brachycranic index falls also the one from grave № 29, which differs from other in the series, with a very low value of the angle between the upper-face height and face length (65,17°), clearly showing a prognathic form of the vertical profile of the face. Faces of skulls in this group are leptoprosopic, with orbits, described as hypsiconch (expressed predominance of the height measurement of orbits), nose of medium breadth (chamaerrhine) with lower margin, formed as *anthropina*, the dakrial index shows high value, the canine fossa is deep. The four hyper-brahycranial skulls (from graves № 147, 219, 278, 284) approach complex of the brachicranial group. Some specifics of skulls, which fall in the hyper-brahycranial rubrication are dakrial index with low and medium values (two cases) and values of the orbital index from the three defined categories (calculated for three cases). Close characteristics to the brachycranial group are ascertained also for the sole ultrabrachycranial skull (from grave № 82).

**Figure 2.** Brachycranial and dolichocranial groups of skulls, frontal, lateral, vertical and occipital view. 2.1. Grave N 245, male, about 50-60 years at death. 2.2. Grave N 29, male, about 30-35 years at death. 2.3. Grave N 219, male, about 30-40 years at death



The skulls grouped by the cranial index into the dolichocranial category (from grave No. 163, 181, 197, 204, 220, 255, 256), are characterized by length- and breadth-height indexes of medium height and low value, while indexes calculated with height from *porion* show that this is not a homogenous group. The upper face index with breadth between both *zygomaxillary* landmarks describes faces as chamaeprosopic (two cases) and leptoprosopic (one case), orbits are low (three cases) and from medium height (one case), the lower margin of the nose aperture is formed as *anthropina* (four cases), with one exception of *fossa praenasalia*. Skulls from graves No. 19 and 214 can be also ascribed to this group based on their complex of indexes characterizing the facial section.

Some already studied craniological series, which stay in close chronological and territorial relation to the one from "40 Holly Martyrs" are those from Bojenishki Urvich fortress (Боев, Кондова, Чолаков, 1979; Боев, Чолаков, 1979) from North-West and Chirakman by Kavarna (Боев, Кондова, Чолаков, 1982) from North-East Bulgaria, the Fortress by Pernik (Боев, Кондова, Чолаков, 1983) from South-West Bulgaria and Kabile, necropolis by the Norh-West Gate (Чолаков, Кондова, Боев, 1991), Perperikon (Kavgazova, Stoev and Boev, 1985) and Tatul (Боев, Чолаков, Кондова, 1978) from the Thracian region. In all of these series, the mesocranial skulls are the most widespread. In Kabile, like in the "40 Holly Martyrs", the distribution of skulls based upon the cranial index shows a higher relative number of brachy- and hyperbrachycranic skulls with the lack of dolichocranial skulls for the females, compared with those of the males. The series from Bojenishki Urvich and the XIV-XV c. necropolises from Chirakman, Kavarna, Kabile and Pernik show similarities with the cranial series from "40 Holly Martyrs" also regarding the distribution of the indexes values, which describe the height-length and -breadth relations with predominance of orthocranial skulls, orthognathous vertical profile of the face, in Bojenishki Urvich and Kabile in combination with low values of the zygomaxillary angle of the horizontal profile. Mean values, obtained from the craniometrical data of the series from Bojenishki Urvich show similar complex of features to the second mesocranial group from "40 Holly Martyrs", regarding the values of the orbital and nasal indexes. The obtained values do not strongly deviate from the ones found in the first mesocranial group from the "40 Holly Martyrs". The series from Bojenishki Urvich shows similarities to the studied one also as regards the formation of the lower margin of nose aperture and canine fossa of medium depth. A similar distribution of the values of the indexes to the first and second mesocranial group from "40 Holly Martyrs" is found in the series from Kabile, where there were also found an equal distribution of both basic forms of lower margin of nose aperture, low values of zygomaxillary angle and low to medium values of the depth of the canine fossa. In the series from Perpericon the distribution of the mean values, which describe the cerebral section, approaches to the complex of the second mesocranial group from "40 Holly Martyrs". In regard of orbital and nose indexes, this series resembles the first mesocranial group in "40 Holly Martyrs". Values of the indexes, obtained from the basic measurements of the face index in craniological series from Pernik-Fortress have a large variation. Values of the palatal index, zygomaxillary angle and depth of the canine fossa stay close to the first mesocranial group from the "40 Holly Martyrs" necropolis. Values of the nose and orbital indexes in this series remain in-between of the mean of the first and second mesocranial groups from the "40 Holly Martyrs", while the values of the upper face index, calculated by the breadth between both zygomaxillary landmarks are close to the mean value of the second mesocranial group from the "40 Holly Martyrs". As inferred from the little information available, a higher homogeny of values for the basic indexes in the females, in comparison to males is registered in most of the studied series. The series from Tatul appears as a different case compared with the one from "40 Holly Martyrs", with a high variety of craniological characteristics.

The comparison of results obtained for the "40 Holly Martyrs" necropolis with the known data for the previous period, XI-XII с AD, such as the series from the secondary interments on the mound necropolis, Kabile (Боев, Чолаков 1991), Kovachevo (Boev et al. 1977), Odartsi necropolis № 1 (Кондова, Чолаков 1993) and № 2 (Йорданов, Димитрова 2005) and Pliska, west wall (Боев, Чолаков 1992) reveals similarities with different complexes of craniological features from the one, or two of the mesocranial groups, mostly spread in the XIII-XIV c. AD. The closest complex is found in the series from Kabile and Pliska, with its mean values similar to the complex of the second and third mesocranial group from "40 Holly Martyrs". The population from Kovachevo shows again a close complex of mean values for females to the both same groups from "40 Holly Martyrs". For

the males, characteristics of the facial part remain close to the same complexes in "40 Holly Martyrs", but those of the cerebral section are closer to the defined dolichocranial group. Similar results were obtained by the comparison with the data from Pliska. In the latter series, the mean values of cranial index are close to the lower limits of the mesocranial category, but the dolichocranial skulls prevail in the distribution of the cranial index in males (Боев, Чолаков 1992, 128). This peculiarity alienates the latter series from the studied one. Similar results were obtained after the investigation of the necropolises Odartsi № 1 and 2, where mean values of cranial index fall close to the lower limit of the mesocranial category. The distribution in Odartsi 2 shows a relatively higher portion of dolichocranial and brachycranial skulls and despite the highest relative number of mesocranial skulls in the series (Йорданов, Димитрова 2005: 418, 427) it remains significantly lower than the one ascertained in "40 Holly Martyrs". Mean values of the remaining craniometrical indexes and measurements in both series from Odartsi are close to those ascertained in the "St. 40 Martyrs" for the second and third mesocranial groups. Meanwhile, a difference in the distribution of values in the categories appears between "40 Holly Martyrs" and Odartsi 2, ascertained for height-length and height-breadth indexes, the latter with the predominance of acrocranial types in Odartsi. Similar differences are observed in the distribution of the basic indexes of the facial section. In conclusion, it can be pointed out that the series from the previous period show higher diversity of the basic craniological features, while the series from "40 Holly Martyrs", as the other synchronous to it, shows significant predominance of a more homogenous community, with presence of less numerous groups, with different complex of features.

Comparison of the results from the "40 Holly Martyrs" necropolis with the craniological series of the Late Middle Ages from Romania (Wallachia region) reveals a similarity regarding the mean values of our series to that from Străulești (third-fourth decade of the XV-second half of XVI c. AD) as reported by previous studies (Popovici 1973: 22-23, tabl. 1-2). Despite this resemblance, the comparison regarding the distribution of skulls in the series of Străulești II (Popovici, 1966) highlights obvious differences, with a higher proportion of mesocranial skulls and a lower ratio of dolicho- and brachycranial skulls. In both "St. 40 Martyrs" and in Străulești necropoles, dolicho and brachycranial skulls are relatively equally represented, as also in Odartsi 2. Specific traits of the meso- and dolichocranial skulls in Străulești are similar to the complexes of the second and third meso- and dolichocranial groups identified in the "40 Holly Martyrs" series. Both brachy- and the only hyperbrachycranial skulls found in the Romanian series do not show similarities - regarding the craniological complex – to the corresponding groups in the studied Bulgarian series. As for the main craniometrical indexes, distribution of the material displays similarities between the studied Bulgarian series and that from Verbicioara, XIII-XIV centuries A.D. The comparison of mean values of the defined craniological groups in the series from "40 Holly Martyrs" with data from close chronological Romanian series, as from Bîtca Doamnei (XII-XIII c. AD) and Trifești (XIII c. AD) from Northern Moldova (Botezatu, Ştefănescu 1970: 17 Tabl. 2), also reveals differences between brachy- and hyperbrachycranial groups in Bulgarian and Romanian series regarding their main craniometrical indexes –such as the height relations, orbital, nasal and jaw indexes.

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