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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Clinical and autopsy findings of the homeless

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SUMMARY

Introduction/Objective The population of homeless people has been growing rapidly over the past decades, and is a part of regular repertoire in daily autopsy practice.
The paper aims to establish a contingent of autopsy findings specific for homeless persons using a cohort approach.

Methods The study group consisted of the bodies of 37 homeless men autopsied in the past 15 years. The control group consisted of 37 men and was created by a driven randomized selection following the same distribution of the causes of death. A standardized full autopsy was performed in every case, followed by microscopic examination and toxicology if indicated. Many external and internal features were compared.

Results Homeless people lived significantly shorter, and were more often unidentified at the time of autopsy ($p < 0.05$). As for external features, we found that homeless people were significantly shorter, with longer hair, beard, and nails, and worse dental status compared to the control group ($p < 0.01$); 70.3% of the homeless people were underweight; significantly more often suffered from infectious lung diseases, alcoholic liver disease and showed signs of old brain contusions ($p < 0.01$); they had higher blood alcohol concentrations at the time of death compared to the controls ($p < 0.05$), but a significantly lower atherosclerotic grade ($p < 0.01$), and were found to die significantly more often during the winter months ($p < 0.01$). Besides this, the homeless are more usually affected by specific and non-specific lung inflammations and alcohol liver diseases.

Conclusion Autopsy findings of homeless people define an almost particular presentation compared with controls**.**

Keywords: homeless; autopsy; tuberculosis; alcohol liver disease

INTRODUCTION

The progress of human civilization in developed countries has created a huge gap between social categories of the population. In all of these countries, more frequently in larger cities, we find a population of homeless people, which has been growing rapidly over the past decades [1]. Homeless people have a specific way of living, primarily hygienically unacceptable, followed by poor diet, excessive alcohol consumption, and inadequate clothing. They live in the streets, in improvised shelters, under bridges, etc. – in places which don't satisfy the minimum human needs. These are people without families, or people that have been rejected by their families, often suffering from various mental illnesses, drug and alcohol abuse, and who are often involved in fights and theft [2]. Winter time of the year represents one of the biggest challenges for their survival.

Considering the way of living, death of a homeless person is a part of regular repertoire in daily autopsy practice, almost without exception in all societies.

Even though well-known and expected, the autopsy findings of a homeless person have not been evaluated in a scientific manner to date.

The paper aims to establish a contingent of autopsy findings specific for homeless persons using a cohort approach. The study is performed under the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for cohort studies [3].

METHODS

The present study is based on the comparison of autopsy findings between two groups of people. In the last 15 years, 38 bodies of homeless persons have been autopsied at the Institute for Forensic Medicine in Podgorica, Montenegro, Southeastern Europe – 37 men and one woman. The woman was excluded from the study, in order to achieve absolute homogeneity of the sample by gender. A criterion for qualifying a man as a homeless person was that he did not have a permanent accommodation in the previous10 years, but has lived in makeshift housing, often under bridges, in abandoned or demolished old houses, basements of apartment buildings, parks, and the like. The control group consisted of 37 men who have also been autopsied at the same institution in the same period. They were randomly selected from 700 men autopsied during this period, who were within the minimum and maximum age of the deceased homeless persons. In addition to the age-matched criterion, the control group was created by driven randomized selection of controls following the

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same distribution of the manner of death as it was in the group of homeless people. Putrefied bodies were excluded from the study.

A standardized full autopsy was performed in every case, followed by the microscopic examination. At the external examination of the corpse, the following characteristics were observed: nutrition status (described as underweight, normal, and overweight), body height (in centimeters), hair length (one of the longest hair strands in centimeters), length of beard/mustache (in centimeters), nail length (in millimeters – measured from the edge of the finger), descriptive feature of the overall dental status (graded in accordance with experience as poor – 0, medium – 1, and good – 2). During the autopsy, the following parameters were checked: *plaques jeunes* (old cortical contusions), coronary atherosclerotic grade (defined as Gr0 – smooth intima, Gr1 – rare small plaques, Gr2 – numerous individual plaques or confluent plaques, Gr3 – calcified plaques, Gr4 – calcified and ulcerated plaques), the lungs and pleura (for pneumonia and/or tuberculosis), and the liver (for alcohol liver diseases).

In addition to these characteristics, the age at the time of death is given, as well as the knowledge of identity of the corpse at the time of autopsy. Blood alcohol concentrations (BAC) in milligrams per gram at the time of death and the season when death occurred were also compared between the groups. The seasons were defined following the calendar: spring, summer, autumn, and winter.

The data were analyzed using descriptive statistical methods, Student's t-test and the χ^2 test.

RESULTS

Regarding driven randomization for controls, the distribution of the causes of death was the same in both groups: 24 died from a natural cause (64.9%), six from hypothermia (16.2%), four due to carbon-monoxide poisoning (10.8%), two were injured as pedestrians (5.4%), and the last one was killed by a blunt object (2.7%). Regarding driven randomization of controls, we chose 24 natural deaths, 12 accidental, and one homicidal case.

Mean age at the time of death in the homeless group was 53.2 ± 11.1, whereas in the control group it was 55.7 ± 11.65, which is not significantly different ($t = 0.169$, $p > 0.05$), but was significantly shorter regarding general male population in Montenegro ($t = 2.669$, $p < 0.01$).

There were 10 unidentified people in the homeless group at the time of autopsy, which is significantly more compared to three people with unknown identity in the control group ($\varphi = 0.249$, $p < 0.05$).

General external parameters are given in Table 1. Nutrition status is presented in Figure 1. While the controls follow the normal Gaussian distribution, homeless people are significantly more often undernourished ($p < 0.01$).

Organ-specific features are given in Table 2. Among 17 homeless persons positive for lung disease, in 65% unspecified pneumonia (bacterial of viral) was found, followed by 35% of any stage of tuberculosis (TBC).

Table 1. General external findings between the groups

Variable	Homeless	Controls	p
Mean height (cm)	172 ± 7.4	178.1 ± 7.5	< 0.01
Mean hair length (cm)	15.3 ± 11.2	6.0 ± 3.5	< 0.01
Mean beard and mustache length (cm)	2.4 ± 2.1	0.4 ± 0.7	< 0.01
Mean nail length (mm)	2.1 ± 1.3	0.6 ± 0.6	< 0.01
Dental status; (poor – 0; medium – 1; good – 2)	0.4	1.7	< 0.01

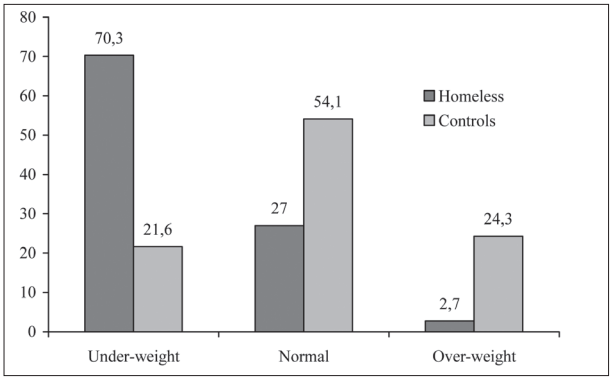

Figure 1. Nutrition status

Table 2. Internal findings between the groups

Variable	Homeless	Controls	p
Liver (number of cases with any type of alcohol liver diseases)	21	5	< 0.01
Lungs (number of cases with affected lungs)	17	3	< 0.01
Yellow plaques (number of positive cases)	11	2	< 0.01
Mean atherosclerotic grade (Gr1 = 1; Gr2 = 2; Gr 3= 3; Gr = 4)	1.19 ± 0.84	2.03 ± 0.8	< 0.01
Mean value of blood alcohol concentration (mg/g)	0.41 ± 0.97	0.09 ± 0.27	< 0.05

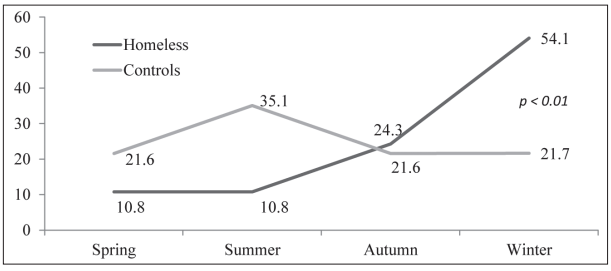

Figure 2. Seasonal distribution of deaths

Among those six homeless persons positive for TBC, five of them had active TBC and one had the signs of TBC history (caverns, fibrothorax, and calcification of the lymph nodes). Regarding controls, only three of them had lung disease and pneumonia was seen microscopically. Presentation of lung diseases between the groups is significantly different ($\varphi = -0.426$, $p < 0.001$). Similar observations were made when it comes to the alcohol liver disease, which was significantly more present in the homeless ($\varphi = -0.453$, $p < 0.001$).

Figure 2 presents the distribution of deaths over the seasons. Using the χ^2 test, homeless people were found to die significantly more often during the winter months,

compared to other seasons ($p < 0.01$) – in fact, half of them die during winter.

It was quite challenging to categorize clothes in the homeless group, but a pattern of wearing many layers of clothes (e.g. two jackets, two pullovers, three t-shirts, a pair of jeans, trousers, pajamas, and a few socks, all on the same body), often seasonally inappropriate, was observed. Moreover, the most constant fact is that the clothes are old, worn out and weathered, with an unpleasant smell. The pockets are usually full of rubbish: plastic bags, crumpled pieces of paper, different plastic and/or small metal objects, etc.

DISCUSSION

Inspired by similar researches and the rising frequency of homelessness, respecting outer appearance, external examination of the body, as well as internal specific features, we tried to characterize the prototype of a deceased homeless person.

In this study, the mean age at the time of death among homeless people was 53.2 ± 11.1, which is older compared to the results of two similar studies performed in India [4, 5]. In these studies, the average age of homeless victims in Mangalore city was 42.8, whereas the commonest age group involved in South Delhi was 31–40 years. The difference can be due to the fact that the mean age of general population in Montenegro is 39.2 versus 27 in India, according to the CIA World Factbook [6, 7]. The Cultural and socioeconomical differences, as well as the different size of gap between population classes may also be the reasons.

The majority of homeless in our study died of natural causes, which is consistent with similar studies performed in South Delhi, India, Boston, USA, Calgary Canada, and Istanbul, Turkey [5, 8, 9, 10]. On the other hand, the study conducted in the city of Mangalore showed that the most common manner of death in the population of homeless was suicide (36.6%), followed by accidents (36%). There were no cases of suicide in our study, but the percentage of accidents was almost the same. The summary of causes of death throughout different studies is given in Table 3.

Drug abuse was identified as a rising problem among homeless people in developed countries decades ago [11]. Nowadays, drug overdose is reported as one of the most common causes of death in this population in the USA and Canada [8, 9]. However, in the present study, we did not find any such case. These variations can be explained by the fact that Montenegro belongs to the EUR-B region, where prevalence of problematic illicit drug use is lower compared to other European countries (EUR-A and EUR-C regions) or the USA and Canada (AMR-A region) [12].

Table 3. Differences between the manner of death in various parts of the world

Location	Natural deaths	Accidents	Suicides	Homicides
Istanbul [9]	60.3%	39.7% belong to violent deaths in general		
Boston [3]	65.3%	30.3%	2.8%	1.6%
South Delhi [4]	61.4%	31.7%	3.4%	3.5%
Mangalore [3]	26.5%	36%	36.6%	0.9%
Present study	65%	32%	0%	3%

Considering that underweight has usually been associated with homelessness, bad nutrition status is not surprising in 70.3% of homeless people in our study. On the other hand, recent studies in the USA have suggested that obesity may be the new malnutrition of the homeless in this country, equalizing the lack of food and bad food, since a cheap "high fat / high sugar / addictive food" is plentifully produced in western countries, especially in the USA, and is available at a lower price [13, 14]. According to a public health study performed by Tsai and Rosenheck [13], 57% of chronically homeless people were overweight or obese. Another study in Boston showed that prevalence of obesity among homeless was 32.3%, while only 1.6% were underweight, suggesting the same weight distribution as for the general population [14]. Compared to western countries, the presence of unhealthy and very cheap foods in Montenegro is practically negligible and we believe that this is the reason why our results are in accordance with the stereotype of the homeless population as underweight. Another thing which suggests that homeless people in Montenegro do not consume this type of food is the mean AS grade, which is significantly lower compared to the controls.

On external examination of homeless people, we found some features typically associated with homelessness originated by their lifestyle. Hair, beard, moustache, and fingernails were significantly longer than in the controls. Also, we found that people in the homeless group were significantly shorter than the people in the control group. This may be linked with lower social and economic status of their families, leading to the food intake that was insufficient for them to reach their genetic potential for height. However, more studies are required in order to confirm the influence of suggested factors on lower height found in homeless people.

When it comes to internal examination, alcohol liver disease is a common companion of homeless people, which was shown by other studies in Canada and Japan. [9, 15] Also, homeless people had significantly higher BAC at the time of death compared to the controls. The fact that standard deviation was higher than the mean value for BAC in both the control and homeless group in our study can be explained by a small and non-homogenous sample we obtained concerning this parameter. The observation was similar with the results for beard and nail length in the control group.

The results of our study indicate that homeless people also suffer from lung diseases, especially TBC, significantly more often than the rest of the population. Similar finding was noted in studies conducted in the UK and Japan [16, 17]. Considering that TBC is closely linked to poor living conditions and malnutrition, it becomes the principal disease of poverty. Also, there are studies that suggested that alcoholism may increase the risk of developing TBC as well [18]. Knowing that TBC is common among homeless people, as well as other infectious diseases like pneumonia

and viral hepatitis, a medical examiner should be extra cautious while performing an autopsy of a person with the description given above.

Old brain contusions are often referred to as *plaques jeunes* or yellow plaques, and represent signs of previous brain injuries. The greatest risk factors for brain injury are alcohol and drug abuse [19, 20]. Socioeconomic status also appears to affect traumatic brain injury rates; people with lower levels of education and employment and lower socioeconomic status are at greater risk [21]. Since homeless people have an elevated rate of substance abuse, which may lead to falls and head injuries, as well as an increased risk of being a victim of violent assaults, the obtained result was expected.

Considering the weather conditions in Montenegro, with cold and snowy winters, and the living conditions of the homeless, a very high death rate during the winter is also expected. This is also in accordance with other studies, where homeless people usually die in the seasons with challenging and extreme weather conditions, like rainy seasons in India or winter in Japan [4, 5, 15]. Criminology documented a rise in criminal activity of homeless persons in the late autumn, in an attempt of these persons to reach prison and spend the winter there, as a way of survival.

CONCLUSION

The results of this demonstrated that a deceased homeless person is usually a male in his 50s, shorter than the average, found dead during winter, with poor hygiene and worn out smelly clothing, long hair, beard, and mustache, long dirty fingernails, poor dental status and may be presented with old cortical contusions, any stage of alcohol liver disease and/or pulmonary infection, frequently including TBC.

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REFERENCES

1. Greifenhagen A, Fichter M. Psychiatric homelessness research. From "Psychopathology of the vagrant" to "Homeless mentally ill". Nervenarzt 1996; 67(11):905–10. (German)
2. Beckett MW. The vagrant in the accident and emergency department. Arch Emerg Med. 1985; 2(2):81–4.
3. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Epidemiology. 2007; 18:800–4.
4. Raghavendra Babu YP, Joseph N, Kadur K. Mortality among homeless and unclaimed bodies in Mangalore city – An insight. J Forensic Leg Med. 2012; 19(6):321–3.
5. Kumar A, Lalwani S, Behera C, Rautji R, Dogra TD. Deaths of homeless unclaimed persons in South Delhi (2001-2005): a retrospective review. Med Sci Law. 2009; 49(1):46–50.
6. Central Intelligence Agency. In The World Factbook – Montenegro 2010. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/mj.html
7. Central Intelligence Agency. In The World Factbook – India 2014. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/in.html
8. Baggett TP, Hwang SW, O'Connell JJ, Porneala BC, Stringfellow EJ, Orav EJ, et al. Mortality among homeless adults in Boston: shifts in causes of death over a 15-year period. JAMA Intern Med. 2013; 173:189–95.
9. Page SA, Thurston WE, Mahoney CE. Causes of death among an urban homeless population considered by the medical examiner. J Soc Work End Life Palliat Care. 2012; 8(3):265–71.
10. Büyük Y, Uzün I, Eke M, Cetin G. Homeless deaths in Istanbul, Turkey. J Forensic Leg Med. 2008; 15(5):318–21.
11. Stang HJ. Three-year follow-up of 100 vagrant adolescent drug abusers in Oslo. Acta Psychiatr Scand. 1977; 55:381–90.
12. Degenhardt L, Hall W, Warner-Smith M, Lynskey M. Illicit Drugs. In: Ezzati M, Lopez A, Rodgers A, Murray CJL, editors. Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors. Geneva: WHO; 2003.
13. Tsai J, Rosenheck RA. Obesity among chronically homeless adults: is it a problem? Public Health Rep. 2013; 128(1):29–36.
14. Koh KA, Hoy JS, O'Connell JJ, Montgomery P. The hunger-obesity paradox: obesity in the homeless. J Urban Health. 2012; 89(6):952–64.
15. Tanaka M, Tokudome S. Accidental hypothermia and death from cold in urban areas. Int J Biometeorol. 1991; 34(4):242–6.
16. Patel KR. Pulmonary tuberculosis in residents of lodging houses, night shelters and common hostels in Glasgow: a 5-year prospective survey. Br J Dis Chest. 1985; 79(1):60–6.
17. Toyota E, Ootani N, Matsuda Y, Tajima H. An approach to the control of the so-called vagrant patients with tuberculosis. Kekkaku. 1990; 65(3):223–6.
18. Lawn SD, Zumla AI. Tuberculosis. Lancet. 2011; 378(9785):57–72.
19. Johnston JJE, McGovern SJ. Alcohol related falls: an interesting pattern of injuries. Emerg Med J. 2004; 21(2):185–8.
20. Reilly P, Bullock R. Head Injury: Pathophysiology & Management. 2nd Ed. London: Hodder Arnold; 2005.
21. Hannay HJ, Howieson DB, Loring DW, Fischer JS, Lezak MD. Neuropathology for neuropsychologists. In: Lezak MD, Howieson DB, Loring DW. Neuropsychological Assessment. Oxford: Oxford University Press; 2004.

Обдукциони налаз код бескућника

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САЖЕТАК

Увод/Циљ Примећен је тренд пораста броја бескућника у последњих неколико деценија, а они све чешће бивају обдуковани.

Циљ рада је да дефинише сет специфичних аутоспијских параметара присутних у популацији бескућника, коришћењем кохортног приступа.

Методе Групу испитаника чинило је 37 лешева бескућника који су обдуковани у последњих 15 година. Контролну групу, која је сачињена на основу насумичне селекције према истом узроку смрти, сачињавало је 37 мушкараца. У свим случајевима извршена је комплетна обдукција и, где је било потребно, микроскопски преглед органа и хемијско-токсиколошка анализа. Упоређени су бројни параметри спољашњег и унутрашњег налаза.

Резултати Бескућници живе статистички значајно краће и чешће су у време обдукције били неидентификовани ($p < 0,05$). У спољашњем налазу, у поређењу са контролном групом, статистички значајно чешће се среће млађа животна доб, дужа коса, брада и нокти и лошији зубни статус ($p < 0,01$). Било је потхрањено 70,3% бескућника; статистички значајно чешће су боловали од плућних болести, алкохолне болести јетре и давнашњих контузија мозга ($p < 0,01$); имали су већу концентрацију алкохола у крви у време умирања у поређењу са контролном групом ($p < 0,05$), али и значајно нижи степен атеросклеротских промена ($p < 0,01$), и статистички значајно чешће умиру у зимским месецима ($p < 0,01$). Поред наведеног, они чешће болују од специфичних и неспецифичних запаљења плућа и алкохолне болести јетре.

Закључак Опис случајева смрти бескућника, упоређен са контролном групом, даје готово специфичну слику.

Кључне речи: бескућник; обдукција; туберкулоза; алкохолна болест јетре