Focus on Polish nurses' health condition: a cross-sectional study

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Background. The nursing profession carries with it many negative factors and a high risk of developing chronic diseases, including overweight and obesity. According to statistics, the health condition of this professional group is much worse than that of the average population of the same age. As the largest and most trusted professional group in the world, nurses are critical to the health of any nation. The aim of the study was to assess the Polish nurse's health condition based on real measurements of parameters important for the occurrence of metabolic diseases.

Methods. This is the cross-sectional, conducted among two age groups of Polish nurses (< 50 years and ≥50 years). Study included the measurements with DXA, the assessment of glucose concentration and lipid profile, the measurement of blood pressure and socio-demographic data of the surveyed nurses.

Results. The majority of respondents above 50 years old were nurses with elevated total cholesterol (79.3%), elevated LDL cholesterol (72.8%), 42.4% of studied nurses had hypertension.

Conclusion. Individual, local and national measures to prevent and support the health of this professional group are needed.

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22 Abstract

23 **Background.**
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25 chronic diseases, including overweight and obesity. According to statistics, the health condition
26 of this professional group is much worse than that of the average population of the same age. As
27 the largest and most trusted professional group in the world, nurses are critical to the health of
28 any nation. The aim of the study was to assess the Polish nurse's health condition based on real
29 measurements of parameters important for the occurrence of metabolic diseases.
30 **Methods.**
31 This is the cross-sectional, conducted among two age groups of Polish nurses (< 50 years and
32 ≥50 years). Study included the measurements with DXA, the assessment of glucose
33 concentration and lipid profile, the measurement of blood pressure and socio-demographic data
34 of the surveyed nurses.
35 **Results.**
36 Most respondents above 50 years old were nurses with elevated total cholesterol (79.3%),
37 elevated LDL cholesterol (72.8%), 42.4% of studied nurses had hypertension.
38 **Conclusion.**

39 Individual, local, and national measures to prevent and support the health of this professional
40 group are needed.

41 **Keywords:** nurses, lifestyle, health condition, health promotion.
42

Introduction

44 Nurses are a key resource. They cover more than half of all health professionals in the world,
45 providing essential services throughout the health care system [1]. The health and good condition
46 of this professional group is a guarantee of the quality of care and safety of the patients [2,3].
47 However, the specificity of the work of nurses is daily exposure to many harmful factors that
48 may adversely affect their health, significantly reduce the efficiency of their work, and contribute
49 to an increase in the number of adverse events. The reasons for these risks may be work under
50 time pressure, exposure to physical, chemical, and biological factors, shift work, staff shortages,
51 work in conditions that endanger the patient's life, as well as organizational and local conditions
52 [3-7].
53 Among the factors that pose a threat in the workplace of nurses, we can distinguish:
54 - biological, chemical and physical factors;
55 - factors related to working conditions;
56 - psychophysical factors [3-8].
57 Biological agents are all factors causing infectious diseases (viruses, bacteria, fungi,
58 protozoa), allergens (bacteria, fungi) and biological toxins (endotoxins, mycotoxins). They
59 promote infections of the upper respiratory tract, conjunctiva, eyes, and skin, poisoning and
60 allergies. A biological risk is also posed by single-use medical equipment (syringes and needles)
61 commonly used by nurses [6,7]. Special attention should be paid to viruses that cause hepatitis
62 (HBV, HCV) and acquired immunodeficiency virus (HIV) [9-11]. The most common cause of
63 accidents at work and infections of nurses are occupational exposures resulting from punctures,
64 cuts, or contamination of the skin and mucous membranes with blood or other biological
65 material from patients [6,7,9]. According to the available data, a nurse in his daily work meets
66 25 pathogens transmitted through the blood and mucous membranes [10,11]. Chemical factors
67 present in the nurse's workplace include various types of disinfectants and medications, and
68 personal protective equipment. They irritate the conjunctiva of the eyes, skin, and respiratory
69 tract, which are often allergenic and sometimes even carcinogenic. Physical factors present in the
70 nurse's workplace include noise, radiation, and work in an electromagnetic field [6,7,12,13].

71 Factors resulting from working conditions, such as shift work, overload with duties and
72 long working hours, pose a major threat to the health of nurses. According to the analyzed
73 studies, disturbances in the rhythm of sleep and irregularity of consumed meals are a direct cause
74 of problems with the digestive system, circulatory system, spine and even disorders of the
75 menstrual cycle [14,15]. Research shows a strong correlation between shift work and an
76 increased risk of obesity, which in turn leads to the development of many metabolic diseases.
77 According to researchers the working environment of a nurse and the need of performing
78 specific professional functions that predispose this professional group to greater susceptibility to
79 the occurrence of civilization and occupational diseases [3,10,16]. The next group of threats are
80 psychophysical factors, which include physical stress (static and dynamic) and neuromental
81 stress (emotional stress, stress, depression, occupational burnout) [8,15,17,18].

82   Working for many hours in a forced body position and excessive physical exertion
83 contribute to degenerative changes in the muscular, skeletal, and joint systems as well as chronic
84 back and spine pain [10]. These ailments are relatively common, they occur in the vast majority
85 of nurses over 50 (90%), significantly reducing the effectiveness of their work [19].
86   Shift work not only during the week, but also on Sundays and holidays, significantly
87 disturbs the social and family functioning of the study group. Contact with accident victims and
88 dealing with terminally ill patients contribute to the development of chronic stress and,
89 consequently, to the development of occupational burnout. A common problem among nurses is
90 depression, which affects almost two-thirds of this professional group of varying intensity.
91 [3,20].
92   This is due to the increasingly more frequent patient attitude and social misunderstanding.
93 Researchers point out that hard work, stress, sleep and eating disorders lead to various health
94 complications, in particular cardiovascular diseases, neurological disorders, and weaknesses of
95 immunity [10,21,22]. This translates into the quality and length of their lives [23]. The data in
96 this respect is also disturbing. According to calculations from the last five years, the average age
97 of nurses at the time of death is only 61.5 years, which is much lower than for the entire female
98 population, which in Poland is 81.8 years [23-25]. Moreover, Priano, conducting a literature
99 review, reports that the health of as many as 60-74% of American nurses is endangered due to a
100 lack of physical activity and in 53-61% due to bad eating habits [26].

101   Due to their education, nurses are aware about the importance of health-promoting
102 activities, such as healthy eating, physical activity, coping with stress, sleep hygiene, the ability
103 to deal with stress and maintaining healthy relationships [27]. However, work overload, the need
104 to work in two or more jobs for financial reasons, and therefore lack of time may result in the
105 recommended healthy lifestyle guidelines not being followed, and this knowledge may not
106 translate into self-care of nurses [28]. An example would be the study of the Cardiovascular
107 Nurses Association, where most of nurses working in the field of prevention of heart disorders
108 had a history of hypertension, lipid disorders, and obesity [29]. Studies conducted among
109 American women show that nurses have a lower level of participation in preventive
110 examinations and a healthy lifestyle than the population of other women in this country, and
111 nurses' knowledge in this area rarely translates into their self-care [30]. Long working hours,
112 overload of shift work and a stressful work environment mean that they do not find enough
113 motivation and strength to take care of their health [31-33]. Women's Health Study conducted by
114 Harvard Medical School and Brigham and Women's Hospital among nearly 40,000 Healthcare
115 professionals showed that nurses rarely cared about their health behavior, despite they are
116 engaging in promoting the health of other women [34]. In addition, previous research shows that
117 there is a lack of good practices among nurses regarding proper nutrition or regularity of meals
118 [26,35].

119   In such a critical situation, it is important not only to care for the new medical staff, but
120 also to care for the best health condition of currently working nurses [6]. The need to stay
121 healthy and to identify effective and cost-effective interventions of this occupational group is of
122 particular importance in the face of an ongoing pandemic and aging nursing workforce in order
123 to achieve better health behaviors and identify potential risk factor profiles [36,37].
124
125   The justification for undertaking the research is the necessity to pay attention to such an
126 important professional group to take preventive measures. Support and help in the treatment of
127 existing diseases among nurses with longer work experience will allow for a better and longer

128 development of the potential of educated medical staff. For young nurses starting their work, it
129 will be an extreme fear to avoid neglect resulting in weakening their health condition. The
130 nursing profession in most countries of the world, also in Poland, is performed mainly by
131 women, and men constitute only a small percentage of this professional group. It is predisposed
132 to a significant deterioration of health during the menopause. Therefore, it is important to pay
133 attention to the health condition of nurses, especially that the vast majority of nurses in Poland
134 and around the world are at this age [1,25]. The aim of the study was to assess the Polish nurse's
135 health condition based on real measurements of parameters important for the occurrence of
136 metabolic diseases.
137

Materials & Methods

139 **Design and study participants**
140 That was a cross-sectional, descriptive study, conducted in the 2020 among professionally active
141 nurses in the south-eastern part of Poland (Subcarpathian district). Invitations to participate in the
142 study were send via the website of the District Chamber of Nursing and via social media to 25
143 randomly selected medical entitles selected via randomized algorithm programme using the EPI
144 INFO (StatCalc) software. Assuming the number of professional active nurses in the
145 Podkarpackie Voivodeship, (aprox. 12,400), the sample size included 153 people and amounted
146 to a confidence level of 95% and 8% margin of error. The information contained data on the
147 planned measurements. Among the invited medical entities, 6 gave positive feedback.
148 Information on planned measurements was sent to these centers again. The survey questionnaire,
149 recommendations for participation in the study, proposed dates and times of measurements and
150 contact to the research team for nurses willing to participate in the measurements were made
151 available. Nurses interested in the study could call the indicated telephone number and set a
152 convenient date for measurements as well as obtain answers on their questions.
153 The following criteria for the nurse's section was adopted:
154 - consent to participate in measurements
155 - professionally active nurses
156 - no symptoms of the disease within the last two weeks.
157 Nurses working at the institution that agreed to participate in the measurements were fully
158 informed in writing and verbally about the nature of the study. They were assured of the
159 voluntary, anonymous, and free of charge participation in the measurements. In order to ensure
160 the confidentiality of data, each participant was assigned an identification number and the
161 questionnaires were numbered. The encoded envelope attached to the questionnaire ensured an
162 anonymous return of the data and its relation with the person's measurements. Finally, 156
163 nurses reported willingness to participate in the study, 3 of them were excluded because they did
164 not meet the study inclusion criteria (pregnancy and infection). All measurements were carried
165 out in the Natural and Medical Center for Innovative Research of the Rzeszow University,
166 Rzeszów, Warzywna Street 1A (building G-4 and G-5) for a period of 3 weeks (from February 3
167 to 21st, 2020), in the morning between 9 am to 12 pm. Data from 153 subjects were included in
168 the statistical analysis (**Fig.1**).
169

170 *Figure 1. Flow chart demonstrating the selection of the study
171 participants*, (explanation of abbreviations: D – diabetes, H - hypertension
172 HCh – hypercholesterolemia).
173

174 Measurements included: blood pressure, fasting glucose, lipid profile and body mass
175 composition. 156 nurses participated in the measurements, 3 of them were excluded because they
176 did not meet the study inclusion criteria (pregnancy and infection). Data from 153 subjects were
177 included in the statistical analysis. To check differences between the health condition of the
178 surveyed nurses we divided the study participants into two age groups (<50 years and ≥50 years).
179
180 *Body Mineral Density cut point criteria:*
181 Normal: from +1.0 to -1.0
182 Osteopenia (early stage of osteoporosis): from -1.0 to -2.4
183 Osteoporosis: up to -2.5 and less
184 Advanced osteoporosis: - 2.5 [38].
185 The study methodology has been published in detail [39].
186

187 *Statistical analysis*
188 The estimation method and the following statistical methods were used: in order to present the
189 data, the method of descriptive statistics was used: and standard deviation (SD), a statistical
190 measure of scattering the results around the expected value, number (N), percentage (%), mean
191 ($\bar{x}$), median (Me). To check the normality of the data the Shapiro–Wilk test was perform. The
192 differences between quantitative variables were tested using the non-parametric Mann-Whitney
193 U test.The analysis of variables having the character of qualitative data was carried out with the
194 Pearson chi-square test.
195 To determine the position of a given result against the results of the reference group or
196 population, the division into quartiles was used, i.e. four congregations with an equal number of
197 people:
198 - first quartile (Q1) - 25% of observations are below and 75% above
199 - the second quartile (Q2) (i.e. the median divides the set of observations into two equal parts
200 - third quartile (Q3) - 75% of observations are below and 25% above.
201 The statistical analyses were performed using PS MAGO PRO 6.0 (IBM SPSS STATISTICS
202 26).
203 Statistical significance was set at p < 0.05.
204 The power of the test was calculated using STATISTICA 13.3 for the results relating to the
205 percentage of women with total cholesterol levels above normal. After the introduction Data on
206 the percentage of people with elevated cholesterol and the size of the groups were introduced
207 into the program. Additionally, as a gold standard two tailed test was considered and probability
208 of Type I Error at a level 0.05 was assumed. Under the above constraints, we got highly
209 satisfactory power of test equal to 0.8.
210

211 *Ethics*

212 This research project was carried out in accordance with the Helsinki Declaration. The study was
213 approved by the institutional Bioethics Committee at the University of Rzeszów (Resolution No.
214 30/05/2019) and all appropriate administrative bodies. Both the guardians and the participants
215 gave their informed written consent to participate in the study.

216
217

Results

219 A total of 153 nurses aged 24 to 64 were examined. All of the study participants were women.
220 The mean age of the respondents was 48.88 ± 8.57 years. 39.9% from study participants were
221 women aged below 50 years (39.9%) and above 50 years (60.1%). There was a significant
222 difference (p<0.0001) in the education between the study participants. Higher education had
223 younger nurses. In addition, a significant difference was in participation in preventive
224 examinations. Older women participated in examinations significantly more often
225 (p<0.0001).Descriptive characteristics of the study group are presented in **Table 1**.

226

227 The values of individual parameters in the total of 153 nurses are presented in the **Table 2**. There
228 were significant differences between two groups in most of the variables. Among older nurses a
229 significantly higher level of triglycerides, LDL cholesterol, glucose, SBP, DBP and fat mass
230 were observed. There was also a lower level of T-score BMD in women above 50 years old. On
231 the other hand, younger nurses had higher level of HDL cholesterol.

232 In the **Table 3** variables have been presented as a category. We found a significant differences
233 between the younger and older nurses (p<0.05) in total cholesterol, HDL cholesterol, LDL
234 cholesterol, triglycerides, glucose and blood pressure. The majority of respondents above 50
235 years old were nurses with elevated total cholesterol (79.3%), elevated LDL cholesterol (72.8%).
236 In addition, 48.9% of older nurses had elevated triglycerides, compared to 19.7% of younger
237 nurses. In the older group, 42.4% of women had hypertension and only 18% in younger group
238 (**Table 3**).

239

Discussion

241 The aim of the study was to assess the Polish nurse's health condition according to age groups
242 based on real measurements of parameters important for the occurrence of metabolic diseases.
243 153 nurses aged 24 to 64 participated in our study. We examined both the basic parameters and
244 advanced measurements indicating the actual health condition of the nurses under study and the
245 risk of developing metabolic diseases. Nurses participating in the study assessed their health as
246 good (64.7%), however, it is worrying that more than half of the respondents (65.4%) declare
247 that they did not participate in preventive examinations. It seems obvious that medical education
248 translates into high awareness and compliance with preventive recommendations. The obtained
249 results showed that there is a significant difference between the health condition of nurses over
250 50 years old compared to their younger colleagues. While these results seem to be obvious, they
251 show how important it is to pay attention and take preventive action to avoid the risk of
252 developing many diseases over the years. Earlier studies show that older age significantly
253 reduces the health condition of nurses [40]. In a study by Conceicao at al. even though more than
254 half (52.2%) of the nurses participating in the survey were under 35 years of age, as many as
255 24.4% had factors confirming the risk of developing metabolic diseases [40,41]. The issue of the
256 proper health condition of nurses is also important due to the shortage of nurses all over the
257 world and the huge demand for nursing services due to aging societies [1,42]. In many countries,
258 the statistical age of a nurse is 52-53 years, which is the time when many diseases are
259 physiologically worse. Reports show little interest of young people in the nursing profession,
260 therefore, also in the context of staff shortages, proper prevention and care of this professional
261 group is extremely important [23].

262 Our results show the health condition of Polish nurses, the results concerning nurses in the 50+
263 group are worrying. Analyzing the measurements, we see a significant, sometimes several times
264 increase in the value of individual parameters in the group of older nurses. The majority of
265 respondents above 50 years old were nurses with elevated total cholesterol (79.3%), elevated
266 LDL cholesterol (72.8%). In the older group, 42.4% of women had hypertension. The BMI in the
267 group of nurses studied slightly exceeds the norm (26.0), but when we compare the two analyzed
268 age groups, the differences are significant (23.1 vs 27.4). The data of the report we refer to in the
269 introduction indicate that the life expectancy of nurses is considerably shorter than that of
270 statistical women, which also indicates a much worse health condition of this professional group
271 [23-25]. In the study Woynarowska-Sołdan et all. 44% of the surveyed nurses were overweight
272 or obese, and even though the BMI in the whole group was almost within the normal range
273 (25.1), the BMI value increased with the age of the respondents [43]. A study from Scotland
274 found that 7 out of 10 nurses in Scotland are overweight or obese, and the prevalence of
275 overweight and obesity in Scotland is statistically significantly higher among nurses than other
276 healthcare professionals and non-health workers. The authors of the study point to the urgent
277 need for action to reduce the prevalence of overweight and obesity among the nursing staff in
278 this country [44]. This confirms previous international research that found higher prevalence of
279 overweight and obesity among nurses than the general population in the UK, Australia, and New
280 Zealand [55]. The obtained results are also disturbing due to the fact that the nurses participating
281 in the measurements were not aware of the actual parameters indicating their health condition. At
282 the time of the measurements, most of them realized that they had high cholesterol values, too
283 high glucose levels or hypertension. In a study by Miller et al. although the vast majority of
284 nurses (96%) knew about the risk factors for developing heart disease, 26% were not aware of
285 their diabetes, and about 90% were also unaware of hyperlipidemia [46]. Equally, the results of
286 the Cardiovascular Nurses Association showed that 20%, 23% and 17% of nurses working in the
287 field of heart disease prevention had a history of hypertension, lipid disorders and obesity [47].
288 Faced with the poor health condition of health workers, including nurses, many countries are
289 taking initiatives to support and promote a healthy lifestyle in this professional group. An
290 example is the huge undertaking and the Healthy Nurse, Healthy Nation - Grand Challenge
291 campaign launched by the American Nurse Association Enterprise in 2017 [48]. It is an initiative
292 that engages nurses and health care organizations to take action to improve their physical
293 activity, sleep, nutrition, quality of life and safety for nurses. For those joining the program, the
294 association provides a helpful online platform that inspires action, motivates, promotes a healthy
295 lifestyle, collects data and provides support in undertaken activities. According to American
296 research, nurses are less healthy than the average citizen, are more likely to be overweight,
297 obese, have higher levels of stress, and shift the natural rhythm of sleep and social functioning
298 through shift work. Nurses, as the largest and most trusted professional group in the world, are
299 critical to the health of any nation. By taking care of their health, they can be good models for
300 their patients, families, and friends. This is in line with Forencja Nightingale's recommendation
301 that the nurse should be a good exemplar to others [49].

Limitations and future research

303 To our knowledge, it is one of the first study in Poland where actual measurements of individual
304 parameters were carried out and not based on the respondents' declarations. There are also
305 several potential limitations of the study that need to be considered when interpreting the results.
306 This study was limited in geographic scope and should be repeated among a larger sample and in
307 more regions. Being the study cross-sectional, the causality and temporality issues should not be
308 considered. More research is needed in the larger population of all age groups.

Conclusions

310 Our study shows that the factors potentially considered risk factors for the development of
311 metabolic diseases were more common among older nurses. Our study shows very well the
312 possible consequences that may also occur among younger nurses in the future, if this
313 professional group is not given special protection. High levels of overweight and obesity,
314 hypertension and hypercholesterolemia are potentially harmful to the health of nurses,
315 significantly limiting their efficiency also in the professional aspect. And although nurses have
316 sufficient knowledge in the field of prevention and health promotion, there is often a discrepancy
317 in the implementation of these activities in relation to each other. Research shows that nurses
318 who are involved in taking care of their own health more often pass on to patients the benefits of
319 making correct choices that promote a healthy lifestyle. Therefore, interventions at individual,
320 local and national level are urgently needed. Nurses who already have risk factors for the
321 development of metabolic diseases should be taken care of properly, young staff should be
322 supported and motivated to take care of their health. Interventions among nursing students will
323 help to educate healthy and conscious staff. The poor health condition of nurses means limited
324 opportunities to educate and promote a healthy lifestyle among patients.

325

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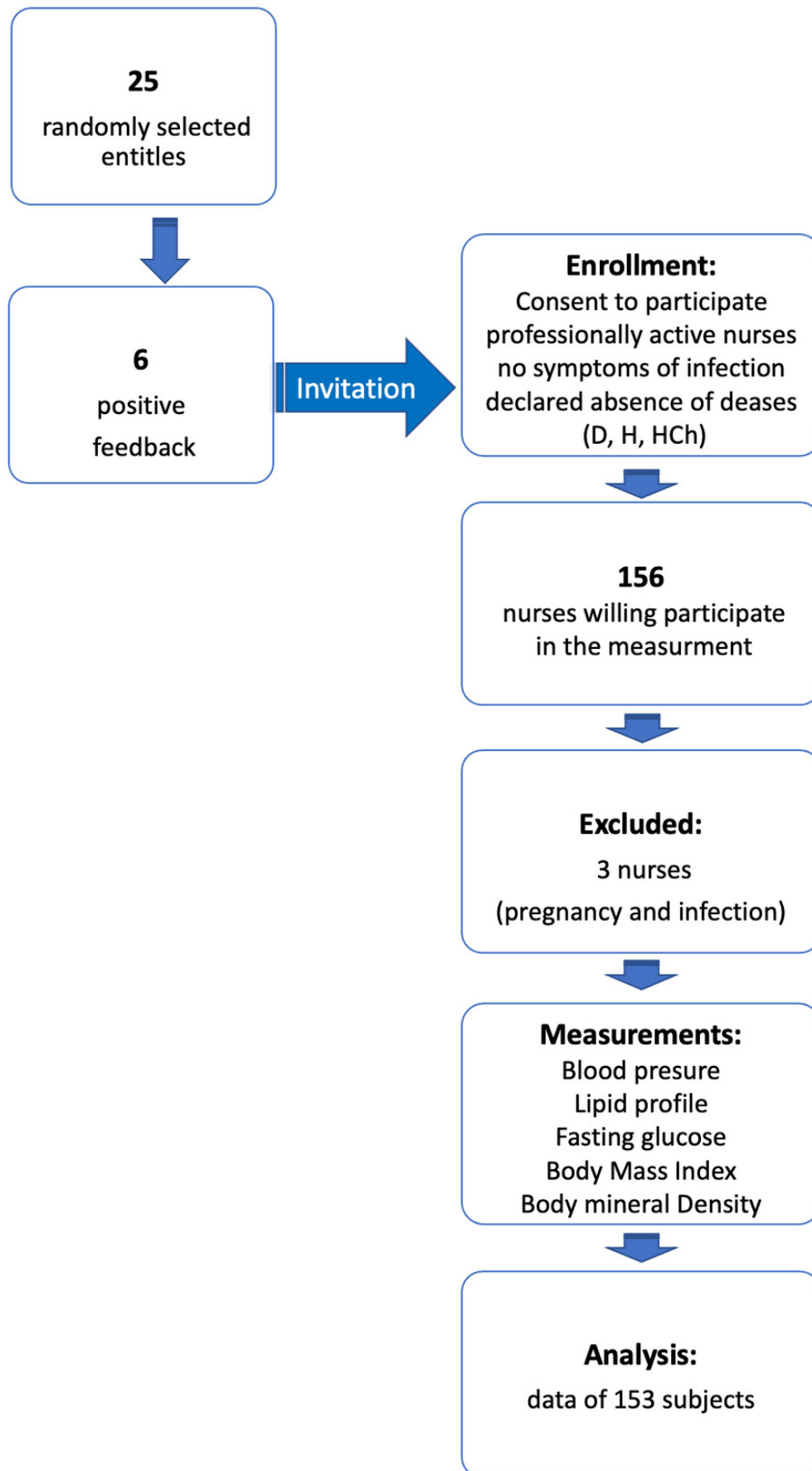
463

Figure 1

Flow chart demonstrating the selection of the study participants.

Explanation of abbreviations: D – diabetes, H - hypertension HCh – hypercholesterolemia

```
┌─────────────────────┐
│        25           │
│  randomly selected  │
│     entitles        │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐            ┌──────────────────────────────┐
│        6            │            │        Enrollment:           │
│                     │ Invitation │  Consent to participate      │
│   positive          │ ────────▶  │ professionally active nurses │
│   feedback          │            │  no symptoms of infection    │
│                     │            │ declared absence of deases   │
└─────────────────────┘            │        (D, H, HCh)           │
                                   └──────────────────────────────┘
                                                │
                                                ▼
                                   ┌──────────────────────────────┐
                                   │            156               │
                                   │  nurses willing participate  │
                                   │     in the measurment        │
                                   └──────────────────────────────┘
                                                │
                                                ▼
                                   ┌──────────────────────────────┐
                                   │          Excluded:           │
                                   │          3 nurses            │
                                   │  (pregnancy and infection)   │
                                   └──────────────────────────────┘
                                                │
                                                ▼
                                   ┌──────────────────────────────┐
                                   │        Measurements:         │
                                   │        Blood presure         │
                                   │        Lipid profile         │
                                   │        Fasting glucose       │
                                   │       Body Mass Index        │
                                   │     Body mineral Density     │
                                   └──────────────────────────────┘
                                                │
                                                ▼
                                   ┌──────────────────────────────┐
                                   │          Analysis:           │
                                   │     data of 153 subjects     │
                                   │                              │
                                   └──────────────────────────────┘
```

Socio-demographic characteristic of the study participants.

p - *p*-value, indicate significant values ($p < 0.05$)

1   **Table 1. Socio-demographic characteristic of the study participants.**

Characteristics	Total (n=153) %	< 50 years (n=61) %	≥50 years (n=92) %	p-Value
Place of residence				
City	83.0	90.2	78.3	0.0549
Village	17.0	9.8	21.7	
Workplace				
Hospital	47.1	54.1	42.4	0.1555
Ambulatory	52.9	45.9	57.6	
Work system				
One shift work	51.0	49.2	52.2	0.7168
Shift work and night duty	49.0	50.8	47.8	
Education				
Basic nursing education	33.3	11.5	47.8	**<0.0001**
Bachelor of nursing	20.3	23.0	18.5	
Nursing (master's degree)	46.4	65.6	33.7	
Additional qualifications				
No	20.3	19.7	20.7	0.8826
Yes	79.7	80.3	79.3	
Self-assessment of health condition				
Very good	14.4	18.0	12.0	0.5139
Good	64.7	60.7	67.4	
I have no opinion	15.7	18.0	14.1	
Bad	5.2	3.3	6.5	
Participation in preventive examinations				
No	65.4	83.6	53.3	**<0.0001**
Yes	34.6	16.4	46.7	

2   *p* - *p*-value, indicate significant values (*p* < 0.05)

Table 2. Values of individual parameters in the study group.

Q25- lower quartile, Q75 - upper quartile, FM – fat mass, BMI – Body mass index, TC – Total cholesterol, HDL – high-density lipoprotein, LDL - low-density lipoprotein, SBP - systolic blood pressure, DBP - diastolic blood pressure, Me – median, BMD – body mineral density, T-score BMD - osteoporotic fracture risk assessment, the result of comparing the patient's BMD with the density of the "young adult" at the age when the bones are strongest.

1 **Table 2. Values of individual parameters in the study group.**

Variable	Total (n=153)			< 50 years (n=61)			≥50 years (n=92)			P -Value
	Me	Q25	Q75	Me	Q25	Q75	Me	Q25	Q75	
Age [years]	51.0	47.0	55.0	45.0	36.0	47.0	54.0	52.0	57.0	**<0.0001**
TC [mg/dl]	214.0	187.0	241.0	195.0	170.0	227.0	229.5	202.0	253.0	0.0697
HDL [mg/dl]	56.0	49.0	66.0	59.0	50.0	69.0	56.0	46.0	65.0	**0.0001**
Triglycerides [mg/dl]	127.0	90.0	180.0	102.0	81.0	130.0	148.0	105.0	206.5	**<0.0001**
LDL [mg/dl]	128.0	104.0	150.0	116.0	90.0	132.0	136.0	113.0	169.5	**0.0001**
Glucose [mg/dl]	93.0	87.0	101.0	90.0	85.0	94.0	96.0	89.5	104.0	**0.0001**
SBP [mmHg]	125.0	114.0	142.0	120.0	109.0	132.0	128.0	120.5	148.0	**0.0012**
DBP [mmHg]	78.0	71.0	86.0	74.0	68.0	80.0	80.0	74.0	87.5	**<0.0001**
BMI [kg/m^2]	26.0	21.9	29.7	23.1	20.4	26.6	27.4	24.4	30.7	0.1317
BMD [g/cm2]	1.2	1.1	1.3	1.2	1.1	1.3	1.2	1.1	1.2	**0.0035**
T- SCORE BDM	1.0	0.2	1.7	1.4	0.6	2.0	0.8	-0.2	1.5	**0.0088**
FM [%]	37.1	31.3	41.5	33.7	28.5	39.1	38.6	34.6	44.0	**<0.0001**

2 Q25- lower quartile, Q75 - upper quartile, FM – fat mass, BMI – Body mass index, TC – Total cholesterol, HDL – high-density
3 lipoprotein, LDL - low-density lipoprotein, SBP - systolic blood pressure, DBP - diastolic blood pressure, Me – median, BMD –
4 body mineral density, T-score BMD - osteoporotic fracture risk assessment, the result of comparing the patient's BMD with the
5 density of the "young adult" at the age when the bones are strongest.

Table 3. Category of variables in the study group.

HDL – high-density lipoprotein, LDL - low-density lipoprotein.

1 **Table 3. Category of variables in the study group.**

Variable	Total (n=153) %	< 50 years (n=61) %	≥50 years (n=92) %	P - Value
Total cholesterol				
Normal (150-190 mg / dl)	28.8	41.0	20.7	**0.0065**
Elevated (> 190 mg / dl)	71.2	59.0	79.3	
HDL				
Normal (> 40 mg / dl)	90.8	96.7	87.0	**0.0403**
Below standard (< 40 mg / dl)	9.2	3.3	13.0	
LDL				
Normal (< 115 mg / dl)	35.9	49.2	27.2	**0.0055**
Elevated (> 115 mg /dl)	64.1	50.8	72.8	
Triglycerides				
Normal (35-150 mg / dl)	62.7	80.3	51.1	**0.0002**
Elevated (> 150 mg / dl)	37.3	19.7	48.9	
Glucose				
Normal (70 to 99 mg / dL)	71.2	86.9	60.9	
Pre-diabetes (100 to 125 mg / dL)	26.8	13.1	35.9	**0.0019**
Diabetes (≥ 126 mg / dL)	2.0	0.0	3.3	
Blood pressure				
Normal (120 - 129 mm Hg / 80 - 84 mm Hg)	59.5	70.5	52.2	
Elevated (130 - 139 mm Hg / 85 - 89 mm Hg)	7.8	11.5	5.4	**0.0054**
Hypertension (>140 mm Hg / 90 mm Hg)	32.7	18.0	42.4	

2   HDL – high-density lipoprotein, LDL - low-density lipoprotein.