

Identification of demographic factors and health problems that affect the acceptance of disease and health behaviors of patients with osteoarthritis

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INTRODUCTION: Osteoarthritis (OA) is one of the most common causes of musculoskeletal system's ailments. In the prevention of the disease and in its comprehensive treatment, it is proper health-related behavior that becomes an extremely important factor for the maintaining of optimal health condition. **THE AIM OF THE STUDY** is to assess the relationship between the reported pain and the disability level and the health-related behaviors undertaken by OA patients as well as their tolerance of the disease. **MATERIALS / METHODS:** The study group consisted of 198 patients with diagnosed OA, according to ACR criteria (1988). The method used in the study was a Pain VAS (0-10), Health Assessment Questionnaire Disability Index (HAQ DI 0-3), Acceptance of Illness Scale (AIS 8-40) and Health and Behavior Inventory (IZZ 24-120). **RESULTS:** The average age among respondents with OA has been 59.16 years of age (± 15.87), duration of disease 5.5 years (± 4.32). Experienced pain, both during movement ($r=0.319$, $p<0.001$) and at rest ($r=0.375$, $p<0.001$) correlated positively with physical disability (HAQ DI). Researches indicated a positive linear correlation between the age and physical disability ($r_s=0.200$, $p=0.005$). Tolerance of the disease (AIS) depends mostly on age ($r=-0.325$, $p<0.001$), on pain in motion ($r=-0.209$, $p<0.001$) and at rest ($r=-0.218$, $p<0.001$) and on the disability levels ($r=-0.353$, $p<0.001$). Analysis of the health-related behaviors (IZZ) indicates the average severity of declared behavior a statistically significant with physical disability (HAQ DI) ($p=0.029$). **CONCLUSIONS:** With age and progressive levels of disability as well as with the severity of pain, the acceptance of illness is reduced significantly. The progressive levels of disability and younger age of the respondents motivate them to engage in health beneficial behavior.

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4 **Acceptance and health behaviors in OA**

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21 INTRODUCTION

22 Osteoarthritis - OA (*morbus degenerativus articularum*), also known as a degenerative
23 disease, is a group of overlapping disorders that despite their different etiologies lead to
24 similar effects within the biological, morphological and clinical results. The disease affects
25 ligaments, joint capsules, synovium, bursitis, trailers, tendons, muscles, and it is often
26 accompanied by the secondary damage to the nerves and veins (*Bannell, Hunter & Hinman*
27 *2012; Jordan et al. 2003*). This applies in particular to the weight-bearing joints, for example
28 knees, ankles, spine and upper limbs, less often hips.

29 The main health problems in OA patients, in the physical sphere are: headache,
30 contracture and distortion of joints and difficulty in moving as well as in performing basic
31 tasks of self-service. There are behaviors resulting from the fear of losing physical mobility,
32 such as fear, anxiety, depressive states, despondency, and reluctance in the mental sphere to
33 undertake any form of physical activity. The progressive nature of the disease causes also
34 problems within the social and professional sphere, that lead to lack of acceptance of one's
35 incapacity for professional work, restrictions in movement and in performing basic activities
36 of daily living as well as isolation (*Østerås et al., 2013; Kolanowski, 2010; Suri & Walsh,*
37 *2012*).

38 For many patients it is extremely difficult to adapt to the changes brought by the
39 chronic, progressive disease, that sometimes results even in a physical disability. Ill person
40 should be prepared for a conscious participation in the treatment process, nursing and self-
41 care. It is important to obtain professional help, support and health education (*Hill, 2006;*
42 *Sierakowska et al., 2010a*).

43 It is important to lay foundation for the proper health-related behaviors that can reduce
44 or prevent the progression of disability and physical dysfunctions. In the prevention of
45 diseases and in the comprehensive approach to its treatment process. Health-related
46 behaviors, which are valid elements of maintaining the organism's homeostasis, concern all
47 types of efforts to maintain restore or improve health. These behaviors are undertaken with
48 regard to the actual state of health and they are designed to produce a specific effect on the
49 patient's health (*Bandura, 2001*).The concept of health-related behaviors is not clear; it
50 usually means activities that are directly or indirectly positive, and in some cases detrimental
51 to maintaining mental and physical health.

52 One of the predictors for health-related behavior, which becomes positively associated
53 with maintaining or recovering health, is the sense of tolerance of the disease. This type of
54 acceptance can be defined as the general belief in the possibility of undertaking and caring out
55 the activities required to achieve a particular result (*Juczyński, 1999; Felton, Revenson &*
56 *Hinrichsen, 1984a*). The belief in the possibility of achieving the objective, that is self-
57 efficacy, can be expressed in taking responsibility for one's own health. The acceptance
58 means also being aware of the fact that control over our own health depends much more on
59 the individual, and not so much on the intervention of medical team. Self-efficacy means
60 being ready to gradually overcome the more difficult tasks or taking new types of action. On
61 the other hand, such an attitude allows for more faith in oneself and one's abilities, and it
62 facilitates adaptation to the reality of the disease (*Amir, 1987; Grohman, 1982*).

63 **THE AIMS OF THE STUDY:** to assess functional capacity of patients with OA
64 in everyday life and their specific physical problems; analysis of health-related behaviors
65 depending on such variables as age, sex, disease duration, pain medication and the use of

66 physiotherapy; to determine the effect of pain and disability on health behavior and the level
67 of acceptance of disease.

68 The researchers hypothesized that in self-care in osteoarthritis, particularly important
69 is the attitude of patients towards disease and their practices that are conducive to health, i.e.
70 behavior that lowers the risk of exacerbations. Such approach contributes to a better well-
71 being stemming from the compliance with treatment recommendations.

72 An important task for health professionals is to motivate the patient to engage in health
73 beneficial behavior. The authors have attempted to identify the factors affecting the
74 acceptance of illness and positive lifestyle, so that educational activities and support of
75 patients with OA would be planned deliberately and accurately.

76 **MATERIALS AND METHODS**

77 The study included 198 patients diagnosed with osteoarthritis of knee, osteoarthritis of
78 the hip and degenerative disease of the spine, within the program of inpatient and outpatient
79 care. The study was conducted at the Department of Rheumatology and Internal Diseases,
80 Medical University of Białystok and Rheumatology Occupation in Augustów, Poland. The
81 inclusion criteria were age ≥ 40 years, diagnosis of OA according to ACR criteria (1988) and
82 informed consent to participate in the study. The criterion for exclusion from the study was
83 the existence of other, overlapping diseases of bone and joint, including inflammatory joint
84 diseases. The study was approved by the Bioethics Committee of the UMB (RI-
85 002/572/2011).

86 The method used was a diagnostic survey, using a questionnaire, visual - analog scale
87 assessment of pain (Pain VAS) during movement and resting (0-10), Health Assessment
88 Questionnaire Disability Index (HAQ DI 0-3) and measurement tools used in the promotion

89 of health and health psychology that are accessible to health professionals, such as:
90 Acceptance of Illness Scale (AIS 8 -40) by *Felton, Revenson & Hinrichsen (1984a)* adapted
91 by *Juczyński (1999)*, and Health Behavior Inventory (IZZ 24-120) by *Juczyński (1999)*.

92 Acceptance of Illness Scale (AIS) contains 8 statements that describe the negative
93 consequences of ill health, taking into account the limitations imposed by the disease, lack of
94 self-sufficiency, a sense of dependence on others and low self-esteem. The scale is used to
95 measure the degree of acceptance of the disease (*Juczyński, 1999*). To assess the level of
96 tolerance of the disease, interpreting the results from 8 - 40 pts. The higher the score, the
97 greater acceptance of illness, better adaptation and lesser the sense of psychological
98 discomfort.

99 Health Behavior Inventory (IZZ) contains 24 statements that describe the intensity of
100 health-related behaviors. The scale allows for the assessment of the intensity of health-related
101 behaviors in four areas (1-5): proper eating habits (type of food intake e.g. vegetables, fruit,
102 whole wheat bread) preventive behavior (following doctor's recommendations, interest in
103 knowledge about the disease), positive mental attitude (avoiding strong emotions and stress)
104 and healthy practices (sleep, recreation, physical activity). IZZ is helpful in planning
105 measures of prevention, behavior modification determining the direction and monitoring of
106 changes in health practices (*Sierakowska et al., 2010a*). For the overall evaluation of health-
107 related behaviors, interpreting the results in terms of 24-120 pts. The results can be converted
108 into raw values sten (1-10), given the temporary standards for men and women (1-4 sten
109 scores low F 24-77, M 24-71; average 5-6 F 78-91, M 72-86 7-10 92-120 high F, M 87 - 120)
110 (*Juczyński, 1999*).

111 Tools used (AIS, IZZ) offer the possibility of a holistic approach to health, derived from
112 pro-health orientation, where the central problem is to maintain and promote health, not
113 illness and its treatment.

114 The severity of pain (Pain VAS 0-10) has been interpreted in three ranges: 0 - 3.5 - a
115 slight degree of pain (low), 3.6 - 6.5 – an average pain (medium), 6.6 - 10 – a strong degree of
116 felt pain (strong) (*Wiland, Madaj & Szmyrka – Kaczmarek, 2008*).

117 The HAQ-DI is a validated generic measure of physical functioning combining eight
118 domains (dressing and grooming, arising, eating, walking, hygiene, reach, grip and other
119 activities). Responses to each item ranges from zero (no difficulty) to three (unable to do).
120 The total score ranges from 0 - 3: 0 – 1 – little degree dysfunctions in any field of daily life; >
121 1 – 2 – serious limitations or need for help in daily activities; > 2 - 3 – total inability to do
122 daily activities without help (*Bruce & Fries, 2003; Thorsen et al., 2001*).

123 DATA ANALYSIS

124 In order to perform the statistical analysis of the collected data, there has been used a
125 method of describing and examining the interaction for quantitative and qualitative
126 characteristics. For independent groups a one-way ANOVA variance was used, through
127 which the hypothesis of equality of means surveyed variables has been verified (to examine
128 the differences between the averages of the individual groups post-hoc test [Tukey test] was
129 used). For nonparametric data statistical test of independence based on chi-square was used.
130 The linear relationship between the measured trait calculating the Pearson correlation
131 coefficient r (r_p) and ordinal correlation Spearman (r_s) has been also examined. Statistical
132 analysis was performed using PQStat v.1.4.2. and Excel. The level of significance $\alpha = 0.05$.
133

134 **RESULTS**135 **General characteristics of subjects with OA**

136 Overall, what we can see in Table 1., the largest group (n=110) of patients diagnosed
 137 with OA was women (55.6%). In terms of age of the respondents they were divided into 3
 138 groups: 40 - 60 years (n=86, 43.4%), 61 - 76 years (n=73, 36.9%), ≥ 77 years (n=39, 19.7%).
 139 The mean age was 59.16 (± 15.87). The average time of disease duration was 5.5 (± 4.32)
 140 years. More than half of respondents (56%) suffered more than 10 years. The level of
 141 education of respondents was as following: n=100 (50.5%) subjects declared primary
 142 education/vocational training, n=61 (30.8%) average, and n=37 (18.7%) higher education. As
 143 it is shown in Table 1., the largest group of patients (n=122, 61.6%) lived in the city. The vast
 144 majority (n=138, 70.1%) of subjects were retired and were married (n=147, 74.2%).

145 The majority of respondents (59%) were taking analgesics during the periods of the
 146 disease's worsening, while 32.3% respondents took them regularly; others (8.6%) declared
 147 that they do not take any medication for pain.

148 The level of physical activity was not satisfactory. More than half of respondents
 149 (52.5%) declared that they did not practice any sport, and only 13.6% practiced daily
 150 calisthenics. A large percentage of respondents (44.7%) did not use any form of rehabilitation.

151
 152 **Table 1.** Patient characteristics and outcomes (numbers means (SD) except where stated
 153 otherwise)

Variables studied (score range)	Mean (\pm SD)
Age	59.16 (± 15.87)

Disease duration years	5.5 (\pm 4.32)
Gender - number of women (%)	110 (55.6)
Educational background	
basic/ professional - number (%)	100 (50.5)
secondary - number (%)	61 (30.8)
higher – number (%)	37 (18.7)
Place of residence	
city - number (%)	122 (61.6)
village - number (%)	76 (38.4)
Occupational status	
retired - number (%)	138 (70.1)
working - number (%)	55 (27.9)
Family Status	
married / married - number (%)	147 (74.2)
widow / widower - number (%)	43 (21.7)
single – number (%)	8 (4.0)
Pain-VAS (0-10) in motion	5.92 (\pm 1.90)
Pain-VAS (0-10) at rest	4.95 (\pm 2.27)
HAQ-DI (0-3)	1.10 (\pm 0.92)
AIS (8-40)	25.75 (\pm 8.47)
IZZ (24-120)	88.39 (\pm 15.5)

154 VAS - visual - analog scale; HAQ DI - Health Assessment Questionnaire Disability Index; AIS - Acceptance of Illness

155 Scale; IZZ - Health Behavior Inventory

156 **The analysis of visual–analog scale for pain perception during motion and rest**
157 **(Pain VAS)**

158 The mean of pain in motion for the test group, as presented in Table 1., was 5.92
159 (±1.90), and the rest 4.95 (±2.27), which indicates the average level of pain. In the performing
160 a detailed analysis of the data on the severity of pain in motion, it was shown that more than
161 half of all respondents (50.5%) declared a strong degree of experienced pain, 29.8% of
162 respondents declared pain while resting. The average value of pain in movement among
163 women, what we can see in Table 2., was 5.1 (±2.22) and men 4.79 (±2.14) ($p=0.694$).
164 Comparably, the average level of pain at rest in a group of women was 5.0 (±2.35) and in men
165 4.88 (±2.17), there have been no statistically significant differences.

166 The relationship between the perception of pain during movement and age of the
167 respondents presents moderate pain in all age groups (data on Table 2).

168 As it is shown in Table 2., the mean of pain during movement in patients with duration
169 of the disease more than 10 years it was the highest value in all group - 6.05 (±1.90). In the
170 performing of a detailed assessment of pain during movement, it was observed that a
171 significant percentage of the respondents (54.4%) suffer over 10 years pointed to strong
172 increase in pain. The average level of pain in the rest of subjects with duration of the disease
173 more than 10 years was 5.22 (±2.31). The perception of pain at rest in patients with disease
174 duration of more than 10 years, 36% rated the severity of pain as medium and strong.

175 The statistical analysis showed a statistically significant relationship between the
176 perception of pain during movement and taking painkillers. Patients who did not take anti-
177 pain drugs rated their pain on the lower level significantly more often - Pain VAS 3.94
178 (±1.81) ($p<0.001$). Respondents who declared average level of pain during movement - Pain

179 VAS 6.10 (± 1.91), more frequently pointed to the regular taking anti-pain medications. There
 180 has been a greater confidence interval for patients who declared that they did not take
 181 analgesics. As it is shown in Table 2., a statistically significant relationship between the level
 182 of pain at rest and administered anti-pain medications ($p < 0.001$). The respondents declaring
 183 that they do not take any medication for pain assessed the slight degree of pain - Pain VAS
 184 2.85 (± 1.88). With the increase of pain at rest the frequency of taking anti- pain drugs has
 185 been intensified.

186 The research on the character of pain in relation to the calisthenics exercises at home
 187 (physiotherapy) suggest that the level of pain experienced both during movement and the rest
 188 was slightly reduced, although it was not statistically significant, with the execution rate of
 189 the individually performed physical exercises at home. The mean of pain during movement in
 190 patients practicing calisthenics at home every day was 5.69 (± 1.78), and the rest 4.66 (± 2.58)
 191 (data in Table 2).

192

193 **Table 2.** The level of pain during movement and resting (Pain VAS) in comparison to the
 194 variables in the group with osteoarthritis.

Variables studied	Pain in motion (VAS 0-10)		Pain at rest (VAS 0-10)	
	Mean (\pm SD)	¹ F-statistic (p-value)	Mean (\pm SD)	¹ F-statistic (p-value)
Sex				
F	5.1 (± 2.22)	0.12 (0.694)	5.0 (± 2.35)	0.12 (0.732)
M	4.79 (± 2.14)		4.88 (± 2.17)	
Age, years				

40 - 60	4.62(±1.92)	0.74 (0.708)	4.83 (±2.17)	0.22 (0.802)
61 – 76	4.96 (±1.57)		5.08 (±2.36)	
≥ 77	4.76 (±2.54)		4.94 (±2.38)	
Disease duration, years				
0-5	5.72 (±2.05)	0.62 (0.539)	4.37 (±2.30)	2.37 (0.096)
6-10	5.78 (±1.71)		4.86 (±2.03)	
>10	6.05 (±1.90)		5.22 (±2.31)	
Intake of analgesics				
during worsening of symptoms	6.10 (±1.75)	11.01 (<0.001)	5.10 (±2.20)	8.49 (<0.001)
systematically	6.10 (±1.91)		5.21 (±2.25)	
not taking	3.94 (±1.81)		2.85 (±1.88)	
Physical exercises				
doesn't perform physical exercises	5.87 (±2.08)	0.84 (0.471)	4.89 (±2.33)	1.19 (0.313)
several times a month	6.42 (±1.60)		5.67 (±2.07)	
2-3 times a week	5.82 (±1.64)		4.76 (±1.99)	
daily	5.69 (±1.78)		4.66 (±2.58)	

195 ¹the univariate ANOVA for independent groups, F statistic; VAS - visual - analog scale

196

197 **The analysis of the level of physical efficiency in carrying out daily activities (HAQ**

198 **DI)**

199 In order to analyze the degree of physical efficiency of patients in everyday activities,
200 there has been used a HAQ DI questionnaire. In the study group, as it is indicated in Table 1.,
201 the average HAQ DI score was at 1.10 (± 0.92).

202 The average value level of disability among women was 1.25 (± 1.07), while in men
203 0.92 (± 0.64). The statistical analysis showed that there is a statistically significant relationship
204 between the level of disability in the performance of daily activities and sex ($p=0.012$) (data
205 in Table 3).

206 The average level of disability in the age group ≥ 77 years amounted to 1.22 (± 0.72) (it
207 was the highest value in all group) ($p=0.028$). The study has shown, that more than half of the
208 respondents (62.4%) aged ≥ 77 years, declared major restrictions or the need for help in
209 activities of daily living (HAQ DI $> 1-2$). Researches indicated a positive linear correlation,
210 what we can see in Table 3., between the age and physical disability ($r_s=0.200$, $p=0.005$).

211 It has been observed that among the patients suffering for more than 10 years, 45.9%
212 the reported severe restrictions or the need for assistance in performing activities of daily
213 living (HAQ DI $> 1-2$). In examining HAQ DI terms of duration OA, as it is shown in Table
214 3., mean value of HAQ in the group of the disease duration patients more than 10 years was
215 1.20 (± 0.66).

216 The evaluation of skills in everyday life, as presented in Table 3., has been positive in
217 patients who declared that they were not taking any anti-pain medications (HAQ DI 0.59
218 ± 0.43). Respondents who regularly took pain killers obtained the highest level of disability
219 (HAQ DI 1.31 ± 0.73). There has been observed a statistically significant relationship between
220 the level of disability in the performance of activities of daily life and intake analgesics
221 ($p=0.012$).

222 The value of the average level of disability among patients that declared that perform
 223 physical exercises daily at home amounted to 0.88 (± 0.71), while in the group that did not
 224 practice any sport - 1.17 (± 1.11), with no statistically significant differences (data in Table 3).

225 Researches indicated a statistically significant correlation, what we can see in Table 3.,
 226 between the level of pain during movement and physical disability (HAQ DI) ($p < 0.001$).
 227 Patients who declared strong level of pain, declared also serious limitations when performing
 228 daily life activities (HAQ DI 1.25 \pm 0.68). There was a positive linear correlation ($r_s = 0.319$,
 229 $p < 0.001$) between the Pain VAS and HAQ DI. The average value for the level of disability
 230 among patients who declared a strong level of pain at rest was 1.47 (± 0.63). It has been
 231 observed that along with improving mobility, level of pain decreased ($r_s = 0.382$, $p < 0.001$)
 232 (data in Table 3).

233

234 **Table 3.** The level of physical disability (HAQ DI) in comparison to the variables in the
 235 group with osteoarthritis.

Variables studied	HAQ DI (0-3)		
	Mean (\pm SD)	¹ F-statistic (p-value)	² r_s (p-value)
Sex			
F	1.25 (± 1.07)	6.38 (0.012)	
M	0.92 (± 0.64)		
Age, years			
40 - 60	0.98 (± 1.17)	1.37 (0.028)	0.200 (0.005)
61 - 76	1.18 (± 0.64)		

≥ 77	1.22 (± 0.72)		
Disease duration, years			
0-5	0.93 (± 1.47)	1.56 (0.211)	
6-10	1.03 (± 0.67)		
>10	1.20 (± 0.66)		
Intake of analgesics			
during worsening of symptoms	1.06 (± 1.03)	4.49 (0.012)	
systematically	1.31 (± 0.73)		
not taking	0.59 (± 0.43)		
Physical exercises			
doesn't perform physical exercises	1.17 (± 1.11)	0.80 (0.496)	
several times a month	1.16 (± 0.60)		
2-3 times a week	1.03 (± 0.62)		
daily	0.88 (± 0.71)		
Pain VAS in motion (0-10)			
low	0.81 (± 1.90)	18.50 (< 0.001)	0.319 (< 0.001)
medium	1.01 (± 0.64)		
strong	1.25 (± 0.68)		
Pain VAS at rest (0-10)			
low	0.92 (± 1.28)	18.28 (< 0.001)	0.382 (< 0.001)
medium	0.97 (± 0.60)		
strong	1.47 (± 0.63)		

236 ¹the univariate ANOVA for independent groups, ¹F-statistic; ² r_s Spearman correlation; HAQ DI - Health Assessment
237 Questionnaire Disability Index

238

239 **Analysis of Acceptance of Illness Scale (AIS)**

240 The average value level of acceptance of the disease in the study group, as presented in
241 Table 1., was 25.75 (± 8.47), which indicates the average level of acceptance of the disease
242 among patients with diagnosed OA.

243 Considering gender variable, mean value for the tolerance of disease among women was
244 30.23 (± 8.45), while among men - 28.22 (± 7.54) (data in Table 4).

245 When analyzing the tolerance of disease in relation to age, there has been found, what is
246 presented in Table 4., that patients in three age groups show an average tolerance of the
247 disease. With age the level of acceptance of the disease significantly worsened. The results of
248 statistical analysis showed that there was a statistically significant correlation between the
249 level of acceptance of the disease and the age ($r_s = -0.325$, $p < 0.001$).

250 In statistical analysis of the variable of disease duration and the level of tolerance of the
251 disease, it was observed in Table 4., that along with the duration of OA the level of
252 acceptance of the disease significantly worsened (>10 years - AIS 23.71 (± 7.79)). The analysis
253 indicated a statistically significant relationship between the variables of researches ($p < 0.001$).

254 The respondents who declared that they do not take any medication for pain assessed
255 the acceptance of the disease on a good level - AIS 30.64 (± 9.30) and those who take
256 medication for pain systematically pointed to the average level of acceptance of the disease -
257 AIS 24.35 (± 9.10) ($p = 0.023$) (data in Table 4).

258 Among the patients diagnosed with OA there was no statistically significant
 259 dependence, as it is indicated in Table 4., between practicing calisthenics at home and the
 260 level of acceptance of the disease. Regardless of whether the respondents play sports every
 261 day or several times a month they declared an average tolerance of disease.

262 As it is shown in Table 4., a negative correlation ($r_p=-0.209$, $p<0.001$) between the level
 263 of acceptance of the disease and the degree of pain perception during movement has been
 264 observed. Along with the seriousness of pain the capacity to accept the disease decreased. A
 265 relation between the level of tolerance of disease and the degree of pain at rest ($r_p=-0.218$,
 266 $p<0.001$) has been also demonstrated. The average value for acceptance of the disease of
 267 respondents evaluating the light level of pain at rest was 27.18 (± 8.66), and severe pain 22.55
 268 (± 8.10) ($p=0.017$) (data in Table 4).

269 It has been also proven that there is a negative linear correlation between the tolerance
 270 of illness and the level of disability (HAQ DI) ($r_p=-0.353$, $p<0.001$). The average value for the
 271 level of acceptance of disease among those declaring dysfunction of slight intensity in every
 272 area of everyday life (HAQ 0-1pkt.) was 28.75 (± 8.53), and among respondents evaluating
 273 the total inability in carrying out activities of daily living (HAQ>2-3pkt.) - 21.06 (± 6.02)
 274 ($p<0.001$) (data in Table 4).

275

276 **Table 4.** The acceptance of the disease (AIS) and health behaviors (IZZ) in comparison with
 277 the variables in the group with osteoarthritis.

Variables studied	AIS (8-24)			IZZ (24-120)	
	Mean (\pm SD)	¹ F-statistic/	² r_s / ³ r_p	Mean (\pm SD)	¹ F-statistic/

		p-value	(p-value)		p-value
Sex					
F	30.23 (±8.45)	2.51 (0.115)		92.51 (±14.02)	4.67 (<0.001)
M	28.22 (±7.54)			83.23 (±15.44)	
Age, years					
40 - 60	28.47 (±7.84)	9.46 (<0.001)	² -0.325 (<0.001)	87.25 (±16.85)	3.47 (0.033)
61 - 76	24.42 (±8.27)			91.84 (±12.75)	
≥ 77	22.23 (±8.45)			84.43 (±15.34)	
Disease duration, years					
0-5	30.31 (±8.54)	11.11 (<0.001)		87.46 (±15.47)	1.06 (0.349)
6-10	26.05 (±8.25)			85.82 (±17.43)	
>10	23.71 (±7.79)			89.46 (±14.46)	
Intake of analgesics					
during worsening of symptoms	25.80 (±7.76)	3.81 (0.023)		87.43 (±15.20)	1.56 (0.213)
systematically	24.35 (±9.10)			91.01 (±15.46)	
not taking	30.64 (±9.30)			85.11 (±15.33)	
Doing physical exercises					
doesn't perform physical exercises	25.26 (±8.83)	0.38 (0.765)		82.67 (±15.91)	13.31 (<0.001)
several times a	26.92 (±8.22)			90.85 (±10.67)	

month					
2-3 times a week	26.38 (± 8.03)			97.64 (± 10.51)	
daily	25.48 (± 8.17)			94.51 (± 14.02)	
Pain VAS in motion (0-10)					
low	29.82 (± 8.70)	3.38 (0.036)	³ -0.209	87.83 (± 15.50)	0.28 (0.753)
medium	25.80 (± 8.38)			89.46 (± 15.07)	
strong	24.68 (± 8.23)		(<0.001)	87.52 (± 15.96)	
Pain VAS at rest (0-10)					
low	27.18 (± 8.66)	4.14 (0.017)	³ -0.218	86.60 (± 15.26)	0.73 (0.482)
medium	27.04 (± 7.93)			88.86 (± 15.51)	
strong	22.55 (± 8.10)		(<0.001)	89.81 (± 15.30)	
HAQ DI (0-3)					
0-1	28.75 (± 8.53)	11.53	³ -0,353	87.81 (± 15.26)	3.59 (0.029)
>1-2	22.20 (± 6.93)	(<0.001)	(<0.001)	87.12 (± 15.33)	
>2-3	21.06 (± 6.02)			98.06 (± 13.30)	

278 ¹the univariate ANOVA for independent groups; ²r_sSpearman correlation; ³r_p, Pearson's correlation coefficient, where 0.10,

279 0.20 and 0.50 represent small, medium and large effects respectively; HAQ DI - Health Assessment Questionnaire Disability

280 Index; AIS - Acceptance of Illness Scale; IZZ - Health Behavior Inventory

281

282 **Analysis of the inventory of health-related behaviors (IZZ)**

283 In the general analysis of inventory of health-related behaviors it has been observed the

284 average intensity of declared behavior - IZZ 88.39 (± 15.34) (data in Table 1).

285 As it is shown in Table 3., health behaviors in the group of women was valued 92.51
286 (± 14.02), while men 83.23 (± 15.44) ($p < 0.001$). The detailed analysis showed that 61.8% of
287 women and 42% of men reported a high intensity of health-related behaviors.

288 Given the age factor, mean value of inventory health behaviors in the group ≥ 77 years
289 was the lowest compared to other age groups, and was 84.43 (± 15.34). The analysis showed a
290 statistically significant relationship between the declared health behavior and the age of the
291 respondents ($p = 0.033$) (data in Table 4).

292 Evaluation of IZZ results in relation to the duration of the disease, what we can see in
293 Table 4., has proven that the respondents in each of the three groups pointed to
294 medium/average intensity of health-related behaviors, with no statistically significant
295 difference.

296 In analyzing the relationship between taking analgesics and inventory health-related
297 behaviors there has been observed, without statistically significant differences, that subjects
298 who received regular medication, declared a high intensity of health-related behaviors - 91.01
299 (± 15.46). People who do not receive any medication for pain assessed the average intensity of
300 health behaviors - 85.11 (± 15.33) (data in Table 4).

301 Analysis of health-related behaviors in relation to the applied physiotherapy at home,
302 showed that patients performing physical exercises every day, declared a high intensity of the
303 declared health-related behaviors - IZZ 94.51 (± 14.02), while those who have not practice any
304 sport pointed to medium/average intensity of health-related behaviors - IZZ 82.67 (± 15.91)
305 ($p < 0.001$) (data in Table 4).

306 In assessing the relationship between the level of pain during movement, and the
307 undertaken health-related behaviors, it has been observed in Table 4., that the respondents

308 indicating a strong level of pain (Pain VAS 6.6-10) declared medium/average intensity of
309 health-related behaviors - IZZ 87.52 (± 15.96). The respondents complaining of severe pain at
310 rest (VAS Pain 6.6-10) also pointed to the average intensity of health-related behaviors - IZZ
311 89.81 (± 15.30). There was no significant relationship between pain and taking health
312 behaviors beneficial to health.

313 In seeking the significant relationship between health behaviors (IZZ), and the level of
314 disability (HAQ DI), what is presented in Table 4., there has been found that the respondents
315 declaring dysfunction of slight intensity in every area of everyday life (HAQ DI 0-1) pointed
316 to the average severity of health behaviors - 87.81 (± 15.26), while patients requiring total
317 assistance in carrying out activities of daily living (HAQ DI > 2-3) declared a high intensity of
318 health-related behaviors - 98.06 (± 13.30) ($p=0.029$).

319 The study showed no statistical significant linear correlation between health-related
320 behaviors and the studied variables.

321 Separate calculation of the four categories of health behaviors (1-5), indicates that the
322 average value for healthy eating habits was to 3.70 (± 0.55), preventive behaviors- 4.13
323 (± 0.60), positive mental attitude - 3.87 (± 0.60), and health practices - 3.76 (± 0.60). Studies
324 have shown that patients received the highest score in the category of preventive behaviors,
325 regarding compliance and obtaining information about health and disease, and the lowest in
326 the category of proper eating habits (type of food they eat).

327 **DISCUSSION**

328 Osteoarthritis is the most common rheumatic disease that affects the elderly people,
329 although it can be a serious health problem in people before the 50-year life. The disease is
330 characterized by joint pain, impaired functioning of the musculoskeletal system, limited joint

331 mobility, that lead to progressive levels of disability, influencing all spheres of patient's life:
332 the physical, psychological, social and occupational (*Bannell, Hunter & Hinman 2012;*
333 *Jordan et al. 2003*).

334 The progressive nature of osteoarthritis undoubtedly affects also the level of acceptance
335 of disease and the development of individual health-related behaviors, promote better health
336 and well-being, or affecting the further development of disease and disability (*Sierakowska et*
337 *al., 2010a*).

338 The authors tend to show the disease from the biomedical, but also psychological,
339 existential and spiritual perspective, having in mind the patient who suffers from a chronic,
340 progressive rheumatic disease. Study of health psychology that enriches the paradigm with
341 the psychological biomedical, social and behavioral dimensions was used. The research tools
342 (AIS, IZZ) are based on the social-cognitive theories and refer to holistic approach to health
343 and disease. In this perspective the assessment of the patient's behavior, that describes health
344 maintenance, physical complaints, methods of coping with the disease or its treatment, takes
345 into account cognitive, emotional and motivational elements. This is particularly important in
346 the rheumatic diseases, which lead to a reduced level of performance, high severity of health
347 problems, and dependence on the environment and, consequently, lower quality of life. To
348 help the patient in solving his/her problems, they must be to known from the individual
349 perspective, in a broad view (*Bandura, 2001; Juczyński, 1999; Felton, Revenson &*
350 *Hinrichsen, 1984a; Amir, 1987; Grohman, 1982*).

351 The dominant problem, from the patient's point of view, is pain experienced during
352 performing physical activities, and to a lesser extent, during resting. The pain of the disease
353 contributes to the feeling of anxiety, irritability, exhaustion, which in turn causes disturbances

354 in the functioning in everyday life. An increasing pain often leads to patient's isolation and
355 loneliness (*Kool & Geenen, 2012*).

356 Assessing the level of severity of pain, depending on gender, it was observed that the
357 average value of pain among women was higher, then men, but also at the secondary level.
358 Reports of *Chen et al. (2011)* confirms that female patients diagnosed with OA are more
359 likely to have a stronger pain in the joints.

360 The results of our study also indicate that with the duration of the disease the level of
361 pain deteriorates. The average pain during movement in the group with disease duration of >
362 10 years it was quite high (>6 mm). The review of literature also shows that with the progress
363 of OA pain worsens. In the study by *Kool & Geenen (2012)* a group with disease duration of 6
364 - 10 years strong pain was felt >74% of patients, whereas in the group ≥ 11 years >93%.

365 Patients, who suffer from the pain of a fairly large severity and difficulty in performing
366 activities of daily life, reach for analgesics and non-steroidal non-inflammatory drugs.
367 According to recommendations for therapeutic approach to OA on the basis of the
368 recommendation of the American College of Rheumatology (ACR), European League
369 Against Rheumatism (EULAR), Osteoarthritis Research Society International (OARSI), in
370 the case of ineffectiveness, non-steroidal anti-inflammatory drugs, it is recommended
371 pharmacotherapy of pain is based on paracetamol, at the lowest effective dose and as short as
372 possible. The optimal therapeutic management of OA requires the combined use of non-
373 pharmacological and pharmacological treatment. It should be noticed that the review of
374 literature reveals that patients with osteoarthritis abuse the aforementioned drugs (*Jordan et*
375 *al., 2003; Hochberg et al., 2012; Zhang et al., 2008*). The patients with osteoarthritis abuse
376 the medications by taking several nonsteroidal anti-inflammatory drugs wanting to stimulate

377 fast therapeutic effect, which only adds to the drugs' side effects. According to the authors,
378 patients hold the false belief about their positive effects on the course of the disease, not
379 taking into account the adverse drug reactions (*Jordan et al., 2003; Zhang et al., 2008*).

380 Little physical activity, lack of motivation for regular exercising is a big problem in
381 patients with OA. In the analysis of our results concerning the impact of pain on performing
382 individual physical exercises at home, it has been demonstrated that patients using
383 kinesiotherapy daily and even several times a month, felt the pain to a lesser extent than
384 subjects who had not practiced calisthenics or had practiced sporadically. To achieve the goal
385 of motion exercises, it is important to know how to effectively fight the pain, what are the
386 permitted types of exercises for an individual patient and how to effectively perform them. It
387 is recommended that patients understand the benefits of physiotherapy, because many of them
388 do not accept these commendations for physical treatment out of fear of exacerbation of pain
389 (*Hill, 2006; Sierakowska et al., 2010a; Sierakowska et al., 2010b*). In our study, almost half
390 of the respondents did not use any form of rehabilitation.

391 The progressive nature of the disease negatively impacts patients' functioning in
392 everyday activities. As a result, in most cases, they need the help of others when performing
393 basic tasks, e.g. walking, eating, personal hygiene, or shopping. Our results based on the
394 HAQ DI have shown that the average level of efficiency in the performance of activities of
395 daily living in patients with OA indicated restrictions or the need for assistance in performing
396 activities of daily living. *Cuperus et al. (2015)* in their study noticed the moderate limitations
397 in the performance of daily living activities in patients with OA. In 76% of patients there were
398 observed difficulties in performing such activities as shopping, cleaning the house, bending

399 up and getting in and out of the car. The smallest limitations were observed with dressing and
400 during personal hygiene.

401 In our study, it was observed that the main activities, which require the help of other
402 people, are reaching, grasping, opening things, receiving and handling. It has been indicated
403 that there is a statistically significant correlation between the perception of pain during
404 movement and rest, and the level of disability in the performance of activities of daily living
405 (HAQ DI). Literature reports point also to a significant correlation between the level of pain
406 and disability in patients with OA. Pain created various limitations, to varying degrees, not
407 only in the performance of professional duties, but also in daily activities and in the pursuing
408 of personal interests (*Jadhav et al., 2001*). *Reis et al. (2014)* indicate, that among women
409 diagnosed with OA, what is similar with our results, that there is a significant relationship
410 between pain and the level of disability in performing basic activities of daily living.

411 In this study there has been observed that there is a relationship between the disability
412 in the performance of activities of daily life and gender. Women assessed their self-care
413 ability worse (HAQ DI) than men. The review of the literature also pointed out to the
414 relationship between the locomotion efficiency and patients' gender. According to *Wilmańska*
415 *& Gulaj, (2006)* men are characterized by better physical efficiency. They also slightly better
416 rated their health.

417 In our study there has been observed a significant effect of age on the level of mobility
418 (HAQ DI). Patients aged ≥ 77 years declared some limitations or need for help in carrying out
419 certain activities of daily living. Studies by *Kool Kool & Geenen (2012)* on OA patients,
420 showed that $>56\%$ of patients above 77 years needed a constant regular care. A statistically

421 significant correlation was found between patients in need of help only in certain everyday
422 activities and in need of constant regular care.

423 An essential psychological factor that helps in coming to terms with the level of
424 progressive disability and escalation of pain is the acceptance of disease.

425 The average value of the level of the acceptance of disease (AIS) in the study group
426 indicated a medium level of acceptance of OA. *Felton & Revenson (1984b)* in their trials in
427 patients with back pain, also indicates the average level of acceptance of the disease. Our
428 findings indicate a negative linear correlation between the level of acceptance of the disease,
429 felt pain during movement and rest and the level of disability. Severe pain and progressive
430 difficulty in daily functioning significantly influence the level of acceptance of the disease.

431 Taking the age factor into account, the younger group (40-60 years) assessed the degree
432 of acceptance of the disease higher than older people ≥ 77 . It has been also observed that along
433 with disease duration, the acceptance of health situation deteriorated, patients presented worse
434 adaptation and a greater sense of psychological. *Creedon & Weathers (2011)*, in their report,
435 point out that the people with diagnosed OA are older, that they are able to more easily accept
436 their health and adopt a positive attitude towards the disease. The researchers emphasize,
437 however, that the relationship between pain and acceptance of the disease is a normal part of
438 the aging process and can significantly compromise the patient's ability to make independent
439 activities of daily life. *Baird (2003)* however, in study that involved 60 women with
440 diagnosed OA aged over 60 years, shows that women have greater difficulties in accepting
441 their illness, disability and pain. In this report there are no significant differences concerning
442 gender, by analyzing variable acceptance of OA.

443 It is worth noting that the social situation of the elderly, the possibility of obtaining
444 emotional support, from the immediate environment significantly affects the level of tolerance
445 of illness and disability. The task of the therapeutic team is not only an effective treatment,
446 but also giving support and advice on how to deal with the problems of everyday life, stress
447 and limitations caused by the disease (*Long et al., 2002; Tak & Laffrey, 2003; Sierakowska et*
448 *al., 2010b*).

449 In the prophylaxis and during treatment of the osteoarthritis it is also important to form
450 behaviors that are beneficial for health.

451 Our results, based on Behavioral Health Inventory (IZZ) indicate an average level of
452 intensity of health-related behaviors. The studied group of women declared a high
453 concentration of health behaviors, while men /average. Juczyński in his studies (*Juczyński,*
454 *1999*) gives a slightly lower average intensity of the declared health-related behaviors among
455 healthy women and menopausal. Men also declared lower level behaviors.

456 In this study, there has been achieved a statistically significant relationship between the
457 declared health behavior and the age of patients. Respondents aged 61- 76 years compared
458 with older and younger, pointed to the high concentration of health behaviors. However the
459 study of *Gignac et al. (2013)*, reveal that middle-aged people are more satisfied in coping
460 with the disease and high severity behavior, compared to healthy subjects and older.

461 Our analysis has also indicated that there is a relationship between health-related
462 behavior and physical disability. Respondents who declared dysfunction of slight intensity in
463 every area of everyday life pointed to medium / average severity of health behaviors, while
464 patients who required total assistance in carrying out activities of daily living. They declared a
465 high concentration of health behaviors. Research with a higher level of behavior conducive to

466 health, are involved in regular physical exercises that improve efficiency and well-being. In
467 study by *Hawker et al. (2011)* it is also showed the impact of quality health-related behaviors
468 on the progressive disability and difficulties on the everyday life functioning.

469 Detailed analysis of the categories of health behavior showed that the study group
470 obtained the lowest average value in healthy eating habits, and most in prevention.
471 Nevertheless, according to *Juczyński* women during menopause declared the overall behavior
472 was somewhat lower, especially for health practices, and the highest score, as in the present
473 study, in prophylactics. Health behavior of adult males were lower than women (*Juczyński,*
474 *1999*). Standards of treatment in osteoarthritis indicate the importance of self-care, proper
475 lifestyle and rehabilitation in OA. A patient who is able to self-manage his/her own lives,
476 accepts the disease and becomes independent, adapts to changing conditions and learns to live
477 and work, despite the existing restrictions at home, as well as occupational and social
478 environment (*Hill, 2006; Sierakowska et al., 2010a*).

479 **Paper limitations**

480 The study on patients with OA and RA have their limitations due to the applied research
481 tool questionnaire, based on assessment of their own health, which prevents an independent
482 verification of data.

483 **CONCLUSIONS**

- 484 1. Although women declare slightly higher difficulties in everyday activities than
485 men, they exhibit more positive health conducive behavior.
- 486 2. With age and progressive levels of disability as well as with the severity of pain,
487 the acceptance of illness is reduced significantly.

- 488 3. The progressive levels of disability and younger age of the respondents motivate
489 them to engage in health beneficial behavior. The subjects present positive pro-
490 health behavior and undertake regular physical exercises.
- 491 4. High intensity of pain and progressive disability impact patients' decisions to
492 follow treatment recommendations regarding analgesics.

493

494 Research has shown the need for taking measures aimed at achieving greater
495 motivation of patients, particularly of the elderly, who should engage in daily physical
496 activity in order to improve their efficiency of learning and effective forms of exercise. The
497 challenge for health professionals should also be an effective fight against arthritis pain,
498 primarily by non-pharmacological methods of pain management, as well as greater access to
499 the various forms of rehabilitation. In planning the health education attention should be paid
500 also to the dietary advice which is conducive to health.

501 **Competing interests**

502 The authors declare that they have no competing interests.

503 **Authors contributions**

504 MS, IWS designed the study. IWS were local investigators. MS, IWS undertook the
505 statistical analyses. All authors interpreted the results and participated in the preparation of
506 the manuscript, read and approved the final version.

507 **Competing interests**

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