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ORIGINAL PAPER

SENSE OF GENERALISED SELF-EFFICACY AND BODY MASS INDEX, DIET HEALTH QUALITY AND PRO-HEALTH BEHAVIORS OF NURSING STUDENTS AND ACTIVE PROFESSIONAL NURSES

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Abstract

Background: Personal resources are one of the determinants of lifestyle and health. The aim of the research was to analyze the relationship between sense of generalized self-efficacy, and body mass index (BMI), diet health quality and health behaviors of female nursing students and active professional nurses. The analyzed variables in the group of students and nurses were also compared. **Material and Methods:** The study was conducted among a group of 269 women (174 students and 95 nurses working at hospitals), using: the *Beliefs and Eating Habits Questionnaire* (KomPAN), Juczyński's *Health Behavior Inventory* (HBI) and the *Generalized Self-Efficacy Scale* (GSES). The BMI was assessed on the basis of anthropometric measurements. Statistical calculations were performed using analysis of variance, the Student's t-test, multivariable regression analysis and Pearson's correlation as well as moderation analysis, with the adopted level of statistical significance at $\alpha = 0.05$. **Results:** Professionally active nurses achieved higher BMI levels (25.95 vs. 22.31 kg/m^2, $p < 0.001$) and a higher non-healthy diet index – nHDI-14 (17.04 vs. 15.00, $p = 0.038$) than students. It was shown that with the increase in generalized self-efficacy (GSE), diet health quality and the level of positive mental attitude, proper eating habits and the overall index of health behaviors increased. The BMI increased with the rise in the non-healthy diet index and with the decline in health behaviors (individual categories and the overall index). It was not found that the group (students vs. working nurses) was a moderator of the relationships between health behaviors and indicators of diet health quality with GSE of the studied nurses ($p > 0.05$). **Conclusions:** Nurses with a higher sense of self-efficacy declared a higher diet health quality and healthier behaviors, and their BMI was related to diet quality and health behaviors. Med Pr Work Health Saf. 2023;74(4):251–61.

Key words: nutritional status, diet, nurses, personal resources, professional status, selected aspects of lifestyle

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INTRODUCTION

The modern holistic concept of health assumes the integration and balance of all dimensions constituting a human being and the complexity of health determinants, with an indication concerning the key role of behavioral factors. In this regard, it is necessary to point out the significance health behaviors in the lifestyle, including a rational model of nutrition, recreational physical activity with the features of health training, effective coping with psychological stress, non-use of psychoactive substances, hygiene of sleep and rest, undertaking preventive examinations, etc. [1]. One of the key environmental determinants of health is a varied and balanced, high-quality, health-rich diet that includes foods with high nutritional density and low energy density, including vegetables and fruits, whole grains, legumes, fermented dairy products, and sea fish, vegetable fats, etc. A balanced diet, rich, e.g., in food antioxidants (vitamins C, E, carotenoids, polyphenols), dietary fibre and unsaturated fatty acids, with the limitation of saturated fatty acids, cholesterol, trans isomers and simple sugars, is a factor contributing to the improvement of health potential and the prevention of chronic illnesses, including cardiovascular, metabolic and neoplastic diseases [2–4].

One of the occupational population groups exposed to behavior-related health risk factors is medical personnel, including nurses, inter alia, due to the rotational system of work (also at night). In studies by numerous authors the negative impact has been confirmed of shift

work on lifestyle and health indicators. Impact in this regard, related to e.g., disturbed circadian rhythm, decreased melatonin secretion and sleep deprivation, may increase health risks, including those associated with the development of excessive body mass and obesity [5–7]. The COVID-19 pandemic increased exposure to stressors and worsened quality of life among nurses [8]. On the other hand, the environment of health care workers, including nurses, has a high level of knowledge about the determinants and threats to health, and can participate in the health education of patients, influencing the modification of their health behaviors [9,10]. In research on the subject, the need to implement health promotion strategies has been demonstrated, including coping with stress, improving mental and physical health as well as quality of life among nursing staff [11,12]. In studies, the prevalence of nutritional errors has been shown as well as other anti-health behaviors that reduce the health potential of health-care workers, including nurses, doctors and students of medical faculties, those with exposure to psychological stress, low levels of physical activity, bad eating habits and other lifestyle aspects [5,6,8,11–21].

Health-related behaviors, including those nutritional, are determined by numerous environmental and individual factors, i.e., psychological features [22]. Among the psychological factors, personal resources play an important role, including sense of self-efficacy. The construct of sense of generalized self-efficacy (GSE) is derived from Bandura's theory of social learning, it is universal in nature and means an optimistic belief in the possibility of achieving intended goals, including health objectives [23–25]. The GSE, modulating the motivation to act, may be a predictor of intention and activity in various areas of human activity, together with health-related behaviors [23–27]. This influences 2 stages of the process regarding change in health behaviors (in socio-cognitive models), i.e., the motivation for change and the will to take action in this direction [23]. In previous research, it has been demonstrated that GSE is associated with health behaviors, including the field of controlling sexual behavior, taking up physical activity, controlling body mass and quality of eating behaviors [28]. In more recent literature, there are works on the relationship of personal resources, including self-efficacy, with the diet and health behaviors of various population groups. Research on the psychological determinants of health behaviors concerned, inter alia, perimenopausal women [29], young women recreationally practicing fitness [30] and females with type 2 diabetes [31]. The research among active nurses and nursing students primarily concerned the relationship between GSE and the ability to cope with stress. In these studies, it was shown that people with a higher level of self-efficacy were more resistant to stress and coped better in difficult situations, because they used effective coping strategies more frequently [8,12,21,32]. Sense of self-efficacy was also found to be related to the quality of sleep and adherence to the Mediterranean diet among Spanish nursing students [33]. In other works, the determinants and importance have been indicated regarding the level of self-efficacy for health and work efficiency of nurses, also during the COVID-19 pandemic [34–36]. According to the authors' knowledge, the Polish literature does not include studies on the relationship between GSE, indicators of diet health quality and the pro-health behaviors of nurses, which was the reason for undertaking the presented research.

The aim of the research was to analyze the relationship between GSE and BMI, the diet health quality as well as the health behaviors of nursing students and professionally active nurses. The analyzed variables were also compared between the group of students and nurses.

MATERIAL AND METHODS

Participants

The research was conducted in the years 2020–2022 among a group of 269 women from the nursing environment, including 174 nursing students at Jagiellonian University Medical College in Kraków, Poland and 95 professionally active nurses employed at health care facilities in Kraków (working at hospitals with a 2-shift, 12-h on-call system). The studied nurses (professionally active) had worked shift work for at least 3 years, and the average weekly work time was 37.55 h. The inclusion criteria for the group were: studying nursing or active professional nurses. The research was carried out in accordance with the principles of the Declaration of Helsinki as revised in 2013, after obtaining participants' informed written consent by the authors of the work personally.

Instruments

Nutrition science, health promotion and psychology tools were applied in the study. The *Beliefs and Eating Habits Questionnaire* created by the Behavioral Conditions of Nutrition Team, Committee of Human Nutrition Science, Polish Academy of Science [37] was

used to assess diet health quality. The pro-healthy diet index (pHDI-10) was assessed on the basis of the frequency of consuming 10 groups of products with potentially beneficial effects on health (wholemeal bread, other whole grain cereal products, milk, fermented dairy drinks, fromage frais, white meat, fish, legumes, fruit, vegetables). The non-healthy diet index (nHDI-14) was evaluated based on the frequency of consuming 14 groups of products with potentially adverse effects on health (light bread, other refined cereal products, fast food, fried foods, butter, lard, yellow and processed cheeses, processed meats, red meat dishes, sweets, canned meats, sweetened carbonated or non-carbonated beverages, energy drinks, alcoholic beverages) [37]. The values of the pro-healthy diet index (pHDI-10) were expressed on a point scale (0–100 pts), according to the methodology in which the results within the range of 0–33 pts are interpreted as low, between 34–66 pts as average and 67–100 pts as high [37]. The validation procedure showed high repeatability of the results [38].

The *Health Behavior Inventory* (HBI) by Juczyński was used to evaluate health behaviors. It contains 24 statements allowing to describe various categories of health-related actions. On the basis of the HBI questionnaire, the overall index of health-related behaviors and the level of its 4 categories (positive mental attitude, proper eating habits, preventive behaviors, pro-health practices), were assessed. The domain of positive mental attitude includes, i.a. maintaining proper interpersonal relations, avoiding strong negative emotions and tension and coping with psychological stress. The category of proper eating habits concerns the quality of food choices, including the consumption of selected recommended products (vegetables and fruits, wholegrain cereals) and limiting non-recommended products (simple sugars, animal fats, salt, processed foods). The domain of preventive behaviors includes, i.a. regular preventive examinations, compliance with medical recommendations and acquiring knowledge about health determinants. The health practice category includes hygiene of rest, sleep, physical activity, avoiding smoking and maintaining weight control. The general score for the pro-healthy behavior index was within the range of 24–120 pts, and the higher its value, the healthier behaviors. Internal compliance of the HBI questionnaire, verified using Cronbach's α coefficient, was 0.85 [25].

Self-efficacy was measured using the *Generalized Self-Efficacy Scale* (GSES) by Schwarzer, Jerusalem and Juczyński [25]. The GSES scores were within the range of 10–40 pts (the higher the score, the higher the sense of generalized self-efficacy). The GSES shows high internal consistency (Cronbach's α-coefficient totalling 0.85) [25].

Body mass index was assessed on the basis of body mass measurements using the TANITA SC-330ST body composition analyzer, while body height was evaluated using the HOLTAIN anthropometer. Measurements were obtained based on the following formula (1):

$$\mathrm{BMI} = \frac{\mathrm{BM}(\mathrm{kg})}{\mathrm{H}(\mathrm{m}^2)} \quad (1)$$

Statistical analysis

Statistical calculations were carried out using the Statistica 13.1 program and applying J.T. Newsom's Macro. Basic statistics (M, SD, Me, min. and max) were used to describe the variables. Analysis of variance was employed to determine differences between indices of diet health quality and the level of individual health behaviors. The Student's t-test was used to define differences in the studied variables between studying and working women, and in the absence of homogeneity of variance, its version with a separate variance estimation was implemented. Pearson's correlation analysis was used to determine the relationship between health-related behaviors, diet health quality indicators, BMI and self-efficacy. It was also checked whether the group (studying vs. working nurses) could be a moderator of the correlation between the level of health behaviors and diet health quality with sense of self-efficacy – moderation analysis (two-way interaction between 2 continuous variables) was used for this purpose. A multivariable regression analysis (forward stepwise) was also performed, in which, in addition to quantitative predictors, the nominal variable "group" was used in the equation as a dummy variable, where 0 meant students, 1 – working women. The level of statistical significance was set at $\alpha = 0.05$.

RESULTS

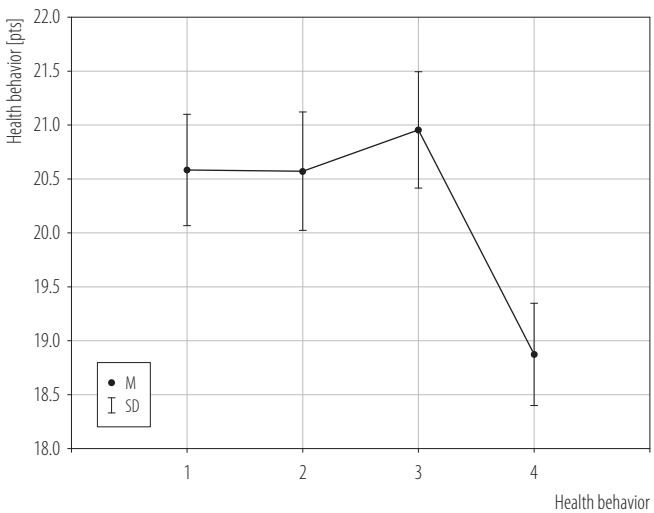
The women included in the study were 20–65 years old (M±SD 30.8±13.7, Me = 22), with female students being M±SD 21.9±3.2 years old (Me = 21), and the working nurses being M±SD 47±10.2 years old (Me = 48).

Descriptive statistics of the analyzed variables for the whole studied group of women allow to indicate that the BMI was M±SD 23.62±4.31 kg/m^2, and the level of generalized self-efficacy totalled M±SD 30.35 ±3.94 pts. The pro-healthy diet index (pHDI-10) was

Table 1. Level of BMI, sense of generalized self-efficacy and indicators of diet health quality and health-related behaviors among the examined studying vs. working nurses (descriptive statistics) (2020–2022, Kraków, Poland)

Variable	M±SD	Me	Min.	Max
BMI [kg/m^2]	23.62±4.31	22.84	16.65	37.05
Generalized Self-Efficacy Scale (GSES) [pts]	30.35±3.94	30.00	18.00	40.00
Diet quality index [pts]				
pro-healthy diet index (pHDI-10)	27.31±11.26	26.90	3.80	68.20
non-healthy diet index (nHDI-14)	15.72±7.69	14.79	1.29	51.79
Health Behaviors Inventory (HBI) – total [pts]	80.99±13.42	82.00	31.00	120.00
positive mental attitude (PMA)	20.58±4.30	21.00	6.00	30.00
preventative behaviours (PB)	20.57±4.58	21.00	7.00	30.00
proper eating habits (PEH)	20.96±4.49	21.00	8.00	30.00
pro-health practices (PHP)	18.87±3.95	19.00	6.00	30.00

BMI: N = 262; other variables: N = 269.



1 – positive mental attitude, 2 – preventive behaviors, 3 – proper eating habits, 4 – pro-health practices, study conducted.

Figure 1. Profile of health behaviors among the studying nurses (2020–2022, Kraków, Poland)

M±SD 27.31±11.26 pts, while the non-healthy diet index (nHDI-14), its level was M±SD 15.72±7.69 pts, with the pHDI-10 value being significantly higher than the nHDI-14 ($F(1, 268) = 179.92$, $p < 0.001$). There was also visible differentiation in the profile of health-related behaviors among women, with the level 1 one domain of health behaviors, i.e., pro-health practices, significantly lower than in the case of other categories, i.e., positive mental attitude, preventive behaviors and proper eating habits ($F(3, 804) = 23.19$, $p < 0.001$) (Table 1, Figure 1).

Comparisons between groups of nursing students and professionally active nurses showed that those already working in the profession obtained higher BMI values (22.31 vs. 25.95 kg/m^2, $p < 0.001$) and a more intense level for the non-healthy diet index – nHDI-14 (15.00 vs. 17.04, $p = 0.038$). The differences in the remaining variables (GSE, pHDI-10 and health-related behaviors) did not reach the level of statistical significance ($p > 0.05$) (Table 2).

The correlation between BMI, diet health quality indicators, health-related behaviors and the results of the GSES were also analyzed (Table 3). A weak correlation between GSE and the indicators of diet health quality (positive with the pro-healthy diet index, and negative with the non-healthy diet index) have been described ($p = 0.042$). It was also found that along with the rise in the sense of GSE, the level of positive mental attitude ($r = 0.25$, $p < 0.001$), proper eating habits ($r = 0.14$, $p = 0.019$) as well as the overall index of health-related behaviors ($r = 0.18$, $p = 0.003$) also increased. The BMI also increased with the rise in the non-healthy diet index (nHDI-14) ($r = 0.16$, $p = 0.010$), and with the decrease of individual categories regarding health behaviors, including proper eating habits ($r = –0.23$, $p < 0.001$) and the overall indicator of pro-health behaviors ($r = –0.24$, $p < 0.001$) (Table 3).

It was not found that the group (students vs. working) was a moderator of correlations between health-related behaviors and indicators of diet health quality along with GSE among the studied nurses ($p > 0.05$) (Table 4).

Regression analysis showed that a model composed of 3 statistically significant predictors explained 27% of the variance of a healthy diet ($R = 0.52$, $R2 = 0.27$, $p < 0.001$), with a positive mental attitude being

Table 2. Comparisons between BMI, sense of generalised self-efficacy, indicators of diet health quality and health-related behaviors among the groups of studying and working nurses (Student's t-test) (2020–2022, Kraków)

Variable	Nurses		t	df	p	Nurses [n]		Variance	
	students	working				students	working	F	p
BMI	M±SD 22.31±3.75	M±SD 25.95±4.26	–7.15	260	<0.001	168	94	1.29	0.153
Generalized Self-Efficacy Scale (GSES)	M±SD 30.08±3.76 pts	M±SD 30.85±4.24 pts	–1.54	267	0.125	174	95	1.27	0.179
pro-healthy diet index (pHDI-10)	M±SD 26.53±11.28 pts	M±SD 28.74±11.13 pts	–1.54	267	0.124	174	95	1.03	0.898
non-healthy diet index (nHDI-14)	M±SD 15.00±7.40 pts	M±SD 17.04±8.07 pts	–2.09	267	0.038	174	95	1.19	0.326
Health Behavior Inventory (HBI) – total[a]	M±SD 81.47±12.19 pts	M±SD 80.09±15.44 pts	0.75	159.0	0.454	174	95	1.60	0.008
positive mental attitude (PMA)	M±SD 20.45±4.33 pts	M±SD 20.83±4.24 pts	–0.70	267	0.485	174	95	1.04	0.828
preventive behaviors (PB)	M±SD 20.59±4.51 pts	M±SD 20.55±4.72 pts	0.07	267	0.947	174	95	1.09	0.606
proper eating habits (PEH)[a]	M±SD 21.31±4.13 pts	M±SD 20.31±5.05 pts	1.66	163.58	0.099	166	95	1.49	0.024
pro-health practices (PHP)[a]	M±SD 19.13±3.65 pts	M±SD 18.41±4.44 pts	1.34	163.85	0.181	134	95	1.48	0.026

[a] Separate variance estimates.

a negative predictor, and the aspect of health behaviors related to proper eating habits and group-positive predictors (Table 5). In the case of the healthy diet indicator, it can be seen that it was more often related to working people than students. It was also found that a model composed of one statistically significant predictor explains 28% of the variance of an unhealthy diet ($R = 0.53$, $R2 = 0.28$, $p < 0.001$), and the aspect of health behavior concerning proper eating habits is a negative predictor (Table 5).

DISCUSSION

The study group of nurses (studying and working) showed a low level of health quality indicators and an average level of pro-health behaviors. Significant differentiation of some of the analyzed variables (BMI and nHDI-14), depending on the professional status of nurses (studying vs. working), was also shown, as well as significant relationships between sense of generalized self-efficacy, diet health quality and some health-related behavior domains. The relationship between BMI, diet health quality and pro-health behaviors of the studied women was also confirmed.

The assessment of BMI in the studied group exhibited significant differentiation regarding professional status, with an indication of higher BMI among the group of working (those older) nurses than in the group of students (analogously younger) (25.95 vs. 22.31 kg/m^2, overweight vs. normoweight). It should also be emphasized that differences in BMI values (working vs. student nurses) may be related to differences in metabolism (large differences in age). The normative values of BMI were also described in other groups of nursing students, including those from Poland (22.49 kg/m^2) [17] and Thailand (20.3 kg/m^2) [39].

The assessment of diet health quality among the studied nurses showed a low level of the pro-healthy (pHDI-10) and non-healthy diet indices (nHDI-14) (27.31 and 15.72 pts, respectively), which means a low, both positive and negative impact of diet on health. It should be noted, however, that the value of the pro-healthy diet index for nurses was significantly higher than the index of the non-healthy diet, and moreover, working (older) nurses obtained a higher index of the non-healthy diet than nursing students. The low level of the pro-healthy diet index (pHDI-10) among nurses is a function of the low frequency of consuming the recommended products, including fruit and vegetables, wholemeal bread and other low-milled cereal products and legumes, as well as milk, dairy products and sea fish. These are products with high nutritional density, containing, inter alia, antioxidant substances, dietary fibre and omega-3 polyunsaturated acids, as well as probiotics, ingredients with significant pro-health values, including active ones, e.g., in the prevention of cardiovascular, metabolic and neoplastic diseases [2–4]. The higher intensity of unhealthy diets among women working at hospitals (the vast majority of them working in a shift system) corresponds to the results of other studies in which the problem of the negative impact of nurses' shift work on their eating habits has been indicated (including a small number and irregular consumption of meals), increasing

Table 3. Correlations between BMI, diet health quality indicators, health-related behaviors and generalized sense of self-efficacy among studying and working nurses (2020–2022, Kraków)

Variable	Pearson's correlation coefficient															
	1		2		3		4		5		6		7		8	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p	r	p
1. BMI	–	–														
2. pHDI-10	0.01	0.911	–	–												
3. nHDI-14	0.16	0.010	–0.08	0.164	–	–										
4. Positive mental attitude (PMA)	–0.13	0.041	0.09	0.129	–0.16	0.010–	–	–								
5. Preventive behaviors (PB)	–0.20	0.001	0.24	<0.001	–0.23	<0.001	0.56	<0.001	–	–						
6. Proper eating habits (PEH)	–0.23	<0.001	0.49	<0.001	–0.53	<0.001	0.42	<0.001	0.50	<0.001	–	–				
7. Pro-health practices (PHP)	–0.17	0.005	0.19	0.002	–0.20	0.001	0.46	<0.001	0.40	<0.001	0.44	<0.001	–	–		
8. *Health Behavior Inventory* (HBI) – total	–0.24	<0.001	0.33	<0.001	–0.36	<0.001	0.79	<0.001	0.81	<0.001	0.77	<0.001	0.73	<0.001	–	–
9. *Generalized Self-Efficacy Scale* (GSES)	0.09	0.141	0.13	0.042	–0.13	0.042	0.25	<0.001	0.11	0.067	0.14	0.019	0.06	0.348	0.18	0.003

BMI: N = 262, other variables: N = 269.

the risk of metabolic diseases [5,6]. These findings also correspond with the findings of the authors' research, indicating increased values of BMI among working nurses (achieving a mean level of excessive body mass, M = 25.95 kg/m^2). Furthermore, in Australian research on the health and nutritional behavior of nurses and midwives, it was shown that older women more frequently followed recommendations regarding the consumption of vegetables and fruit, but also demonstrated excess body mass more often than their younger colleagues [14]. The research also allowed to confirm that nurses and midwives working in a rotating system (night shifts) consumed more energy, total fatty acids and cholesterol as well as total carbohydrates and simple sugars than those working in the daytime system, which increased the risk of excess body mass [16]. Higher dietary intake of energy and macronutrients was also reported among night shift nurses in Israel [40].

The assessment of health behaviors among nurses showed an average level of the overall indicator of pro-health behaviors (80.99 pts, i.e., the 5th sten according to Juczyński's temporary standards), with an indication of differentiation for the health behavior profile. The 3 categories of pro-health behaviors (positive mental attitude, preventive behaviors and proper eating habits) were at a similar level, while the level of pro-health practices, was significantly lower. It should be noted that no significant differences were found for the level of the pro-health behaviors among nurses with different professional status (learning vs. working). In studies carried out at other research centers in Poland, diversified trends have been noted, with an indication of usually average and low levels of health-related behaviors. In other, previous studies, a low level regarding the health-related behaviors of female nursing students (overall HBI index 73.19) was found. At the same time, among the categories of health behaviors (similarly to the discussed results of the authors' research), positive mental attitude was rated the highest while pro-health practices the lowest [17]. Chinese students of medical faculties also declared a low level of pro-health behaviors and low self-esteem concerning health [18]. On the other hand, among the nursing staff employed at a hospital in Wadowice (Poland), the average level of the overall indicator of health behaviors was average (77.87 pts), with the highest level indicated among those working in the operating theatre. Contrary to the authors' research, it was also found that pro-health behaviors intensified with the age of the nursing staff [13]. The correlation between pro-health behaviors

Table 4. Correlations between diet health quality indicators, health-related behaviors and generalized sense of self-efficacy among the studied nurses depending on group (studying vs. working) (moderation analysis) (2020–2022, Kraków)

Variable	β	SE	t	p
Pro-healthy diet index (pHDI-10)	0.04	0.08	0.51	0.612
Non-healthy diet index (nHDI-14)	0.04	0.08	0.46	0.644
Positive mental attitude (PMA)	–0.13	0.08	–1.64	0.103
Preventive behaviors (PB)	0.02	0.08	0.27	0.786
Proper eating habits (PEH)	–0.03	0.08	–0.36	0.722
Pro-health practices (PHP)	0.10	0.08	1.20	0.230
Health Behavior Inventory (HBI) – total	–0.01	0.08	–0.18	0.856

Generalized Self-Efficacy Scale (GSES) as a predictor, group as a moderator.

Table 5. Regression analysis: pro-healthy diet index (pHDI-10) and non-healthy diet index (nHDI-14) (2020–2022,Kraków)

Variable	β (SE)	b (SE)	t(253)	p
pHDI-10				
step 0				
intercept		–4.01 (7.07)	–0.57	0.571
group	0.19 (0.11)	4.56 (2.63)	1.74	0.084
age	–0.08 (0.11)	–0.06 (0.09)	–0.67	0.505
BMI	0.07 (0.06)	0.19 (0.16)	1.15	0.251
Generalized Self-Efficacy Scale (GSES)	0.06 (0.06)	0.16 (0.16)	0.99	0.323
positive mental attitude (PMA)	–0.20 (0.07)	–0.53 (0.19)	–2.82	0.005
preventive behaviors (PB)	0.07 (0.07)	0.18 (0.17)	1.07	0.286
proper eating habits (PEH)	0.53 (0.07)	1.33 (0.17)	8.07	<0.001
pro-health practices (PHP)	0.03 (0.06)	0.08 (0.18)	0.46	0.649
step 1				
intercept		5.12 (3.49)	1.47	0.143
group	0.16 (0.05)	3.75 (1.26)	2.97	0.003
positive mental attitude (PMA)	–0.15 (0.06)	–0.41 (0.16)	–2.62	0.009
proper eating habits (PEH)	0.56 (0.06)	1.40 (0.15)	9.43	<0.001
nHDI-14				
step 0				
intercept		32.91 (4.78)	6.89	<0.001
group	0.09 (0.11)	1.47 (1.77)	0.83	0.408
age	–0.04 (0.11)	–0.02 (0.06)	–0.35	0.729
BMI	0.03 (0.06)	0.06 (0.11)	0.53	0.593
Generalized Self-Efficacy Scale (GSES)	–0.05 (0.06)	–0.09 (0.11)	–0.86	0.390
positive mental attitude (PMA)	0.10 (0.07)	0.17 (0.13)	1.38	0.169
preventive behaviors (PB)	0.01 (0.07)	0.01 (0.12)	0.11	0.911
proper eating habits (PEH)	–0.57 (0.07)	–0.98 (0.11)	–8.74	<0.001
pro-health practices (PHP)	0.03 (0.06)	0.06 (0.12)	0.45	0.653
step 1				
intercept		34.89 (1.94)	18.01	<0.001
proper eating habits (PEH)	–0.53 (0.05)	–0.91 (0.09)	–10.15	<0.001

Step 0 – all predictors in the model; step 1 – statistically significant predictors in the model.

and quality of life among nurses and midwives was confirmed among Australian staff [11]. The low level of health-related behaviors in the domain of health practices (sleep hygiene, rest, restriction of stimulants and physical activity) shown in the research (authors' and others) corresponds with the results of studies in which, inter alia, a low level of physical activity has been indicated among nursing [17] and medical students in general, including active nurses [19,20].

Analysis of the relationship between the included variables: psychological (GSE) and somatic (BMI), nutritional (diet quality) and behavioral (health-related behaviors) has allowed to demonstrate significant relationships between GSE and diet health quality with 2 domains and the overall index of pro-health behaviors, having an indication towards an increase in the pro-healthy diet index and positive mental attitude, proper eating habits and the overall index of pro-healthy behaviors along with the growing GSE among the studied nurses. The determined mean value of the results on the GSES (30.35) indicates a high level of self-efficacy among the surveyed nurses (7th sten according to Juczyński's temporary standards). The obtained tendencies are justified by the characteristics of the personal resources taken into account, i.e., sense of generalized self-efficacy, which increases the belief in the possibility of achieving goals, including those related to health [25]. They are also confirmed by the results of studies carried out in various population groups, indicating a tendency towards a more health-promoting lifestyle of people with a higher sense of self-efficacy. Tendencies towards more rational food choices along with the increasing GSE have been described, inter alia, among perimenopausal women [29] and young women practicing fitness [30]. In this regard, it was confirmed that perimenopausal women, along with increasing GSE, significantly more often consumed products with high nutritional density, including whole grains, raw vegetables and fruits, legumes, fermented dairy products, sea fish and nuts, and significantly less frequently products not recommended in a healthy diet, including fatty dairy products and sweetened as well as alcoholic beverages [29]. On the other hand, tendencies towards more intense pro-health behaviors (positive mental attitude and preventive behaviors) and increasing the volume of physical activity along with an increase in sense of generalized self-efficacy, have been described among Polish and Spanish physical education students [41].

In the authors' study, in terms of the relationship between variables, no significant correlations were found between BMI and GSE, while significant relationships were confirmed between BMI and diet health quality as well as health-related behaviors, with an indication of an increase in BMI along with the increase in the non-healthy diet index (nHDI-14) and with a decline in the level of pro-health behaviors (overall index and individual domains, including proper eating habits). At the same time, BMI turned out not to be a significant predictor of pHDI-10 and nHDI-14. Due to the lack of moderating influence regarding professional status of the examined nurses, these dependencies are discussed for all of the women under study. The non-healthy diet index is related to the frequency of consuming products with high energy density, including those low in fibre (refined cereal products), high in saturated fatty acids, cholesterol and trans isomers (fast food, butter, cheese, processed meat, red meat dishes) and rich in simple sugars (sweets, sweetened carbonated or non-carbonated beverages, energy drinks) [37], which may increase the risk of developing excess body mass (as shown in the discussed research). Positive correlations between BMI and the frequency of consuming high-energy products (white bread, fatty dairy products, fatty meat products, fast food and sweetened beverages) have also been described among perimenopausal women with arterial hypertension [29]. On the other hand, in Mexican studies, it has been confirmed that the pattern of nutrition with the predominance of vegetables and fruit was associated with lower BMI values among women [42]. Also, in older studies among female nursing students from Thailand, associations were shown between proper eating habits (in terms of limiting the supply of fats and cholesterol and increasing the supply of dietary fibre) and lower BMI values [39]. On the other hand, in research among women with diabetes, a decrease was demonstrated in BMI with increasing life satisfaction (positively correlated with sense of efficacy) and with an increase in the volume of physical activity performed weekly [43], which indirectly corresponds to the relationships described in the authors' research under discussion.

The limitations of the presented work are related to, inter alia, the self-report nature of the research tools used, as well as not taking into account other environmental and individual factors that may have affected the analyzed nutritional variables and aspects of lifestyle. Work limitations are also related to the fact that the analyses do not include those variables differentiating the groups of nursing students and professionally active nurses (including age, non-professional duties,

shift work, etc.). There are also other aspects regarding limitations of the work, including small size, cross-sectional nature of the study and not including detailed information about working hours. It should also be noted that BMI is influenced by various factors, in addition to diet, also by, e.g., physical activity level and age, which were not included in the research. It should also be added that when data are collected (diet) by means of a questionnaire, nutrient intakes may be over- or underestimated and that declared food intakes may also not correspond to nutritional status measured by laboratory methods (blood concentrations) as a result of different bioavailability of nutrients from different foods and individual differences in metabolism. In future research, a broader spectrum of environmental and personality factors explaining the behavioral determinants of health among nursing staff could be considered.

CONCLUSIONS

1. Nursing students and active professional nurses declared a low level of diet health quality indices (pHDI-10 and nHDI-14) and an average level of health-related behaviors, while the pro-healthy diet index was higher than the non-healthy diet index. Furthermore, among health-related behaviors, health practices were rated the lowest.
2. There was also significant differentiation regarding some of the analyzed variables (BMI and nHDI-14) depending on the professional status of nurses (studying vs. working), with higher results of the non-healthy diet index and higher BMI values described among working nurses than in the case of students.
3. Significant correlations were observed between sense of generalized self-efficacy, indicators of diet health quality and some domains of health-related behaviors among nurses. Along with the increase in GSE, the health quality of the diet and positive mental attitude, proper eating habits and overall index of pro-health behaviors increased. There was no noted correlation between sense of GSE and the BMI of the studied nurses.
4. Significant correlations between BMI, diet health quality and health-related behaviors of the studied women were shown, while BMI increased along with the rise in the nHDI-14 index and decrease in the level of health-related behaviors (overall index and individual domains).

Author contributions
Research concept: Maria Gacek, Grażyna Kosiba, Agnieszka Wojtowicz
Research methodology: Maria Gacek, Grażyna Kosiba, Agnieszka Wojtowicz
Collecting material: Grażyna Kosiba
Statistical analysis: Agnieszka Wojtowicz
Interpretation of results: Maria Gacek, Agnieszka Wojtowicz
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