

LOCUS OF HEALTH CONTROL AS A PREDICTOR OF DIET IN PREGNANT WOMEN RESIDING IN A SMALL TOWN AND RURAL SETTING IN MAŁOPOLSKA DISTRICT

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ABSTRACT

Background. The locus of health control is one of the individual characteristics determining the diet of an individual.

Objective. The aim of this study was to analyse the consumption frequency of selected food products depending on the locus of health control in a group of pregnant women residing in a small town and rural setting in Małopolska district.

Material and methods. The study was conducted in a group of 300 pregnant women from Małopolska region, who were between 20 and 40 years of age (29.02 ± 6.33). The consumption frequency of food products was examined with a prepared questionnaire, in a 7-item scale (from 7 points – several times a day to 1 point – never). The locus of health control was determined with the MHLC scale developed by *K.A. Wallston* et al., and adapted by *Z. Juczyński*. The relationship between the MHLC scale and the frequency of consumption of various products was estimated on the basis of *Spearman's* coefficients of rank correlation and the *Mann-Whitney U* test, using *Statistica 10.0* software.

Results. Higher level of internal control (MHLC-I) was associated with significant increase in the consumption frequency of orange and red vegetables ($p < 0.01$), marine fish ($p < 0.01$), and seafood ($p < 0.05$), and lower ingestion of margarine ($p < 0.05$). Higher influence of powerful others (MHLC-P) was associated with significant increase in the consumption frequency of cheese ($p < 0.01$), salted snacks ($p < 0.01$), and fast food products ($p < 0.01$), and lower ingestion of whole grains ($p < 0.01$), oat meal ($p < 0.01$), eggs ($p < 0.01$), pork and pork sausages ($p < 0.05$). Higher influence of the chance locus of health control (MHLC-C) was associated with significantly reduced frequency of consuming whole grains ($p < 0.01$), oat meal ($p < 0.01$), nuts ($p < 0.01$), marine fish ($p < 0.05$), and fresh fruit or vegetable juices ($p < 0.05$), as well as with more frequent ingestion of salted snacks ($p < 0.05$).

Conclusions. Pregnant women with the internal control made more rational nutritional choices significantly more frequently than those with the external control.

Key words: *pregnant women, locus of health control, diet*

STRESZCZENIE

Wstęp. Jedną z różnic indywidualnych warunkujących sposób żywienia jest umiejscowienie poczucia kontroli.

Cel. Celem badań była ocena częstości konsumpcji wybranych produktów spożywczych w zależności od umiejscowienia kontroli zdrowia w grupie kobiet ciężarnych w środowisku małomiasteczkim i wiejskim, w Małopolsce.

Material i metody. Badania przeprowadzono w grupie 300 kobiet ciężarnych w wieku 20-40 lat ($29,02 \pm 6,33$) w Małopolsce. Częstość konsumpcji produktów oceniono w oparciu o przygotowany kwestionariusz, w skali 7-punktowej (od 7- kilka razy dziennie, do 1- nigdy). Pomiaru umiejscowienia kontroli zdrowia dokonano z zastosowaniem Skali MHLC, K.A. Wallston i współautorów w adaptacji Z. Juczyńskiego. Zależności między skalą MHLC a częstością spożycia produktów oceniono za pomocą współczynników korelacji rangowych *Spearmana* oraz testu U *Manna-Whitneya*, w programie *Statistica 10.0*.

Wyniki. Wraz z nasilaniem się wewnętrznej kontroli zdrowia (MHLC- W) istotnie wzrastała częstość spożycia warzyw pomarańczowo-czerwonych ($p < 0,01$), ryb morskich ($p < 0,01$) i owoców morza ($p < 0,05$), a spadało spożycie margaryny ($p < 0,05$). Z nasilaniem się kontroli umiejscowionej w innych osobach (MHLC-I) istotnie wzrastało spożycie serów żółtych ($p < 0,01$) oraz słonych przekąsek i produktów Fast food ($p < 0,01$), a spadało spożycie kasz gruboziarnistych ($p < 0,01$), płatków owsianych ($p < 0,01$) i jaj ($p < 0,01$) oraz mięsa i wędlin wieprzowych ($p < 0,05$). Wraz z nasilaniem się kontroli zdrowia umiejscowionej w przypadku (MHLC-P) istotnie spadała częstość spożycia kasz gruboziarnistych ($p < 0,01$), płatków owsianych ($p < 0,01$), orzechów ($p < 0,01$) i ryb morskich ($p < 0,05$) oraz soków ze świeżych owoców ($p < 0,01$) i soków warzywnych ($p < 0,01$), a wzrastało spożycie słonych przekąsek ($p < 0,05$).

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Wnioski. Racjonalne wybory żywieniowe istotnie częściej deklarowały kobiety ciężarne o wewnętrznej niż zewnętrznej kontroli zdrowia.

Słowa kluczowe: kobiety ciężarne, umiejscowienie kontroli zdrowia, sposób żywienia

INTRODUCTION

In the case of pregnant women, balanced nutrition is a prerequisite for normal course of pregnancy and development of the fetus, as well as for the well-being of the mother, neonate, and child during the subsequent periods of ontogenesis [19,27]. Variable diet, rich in products with high nutritional density, is needed to provide a balanced supply of energy and nutrients [21,24,25]. Numerous previous studies have revealed quantitative and qualitative nutritional mistakes that reduce the nutritional value and health benefits of the dietary intake of pregnant women [6,8,9,10,13,20,23].

Health behaviors, including nutritional behaviors, of various population groups, among them pregnant women, are determined by an array of socioeconomic, cultural, and personality-related factors [1,3,5,18]. The locus of health control is one of the individual characteristics determining the health culture of an individual [12]. The locus of health control is defined as a relatively stable belief of an individual that there are factors determining the effects of his/her actions. It represents a continuum between the internal and external control. Internality is a generalized self-conviction that one's activities are efficient, while the external locus of control manifests as disbelief in the possibility of efficient action, and the feeling of dependence on the external environment. In this context, the internal locus of health control refers to the personal feeling of self-control and direct influence on one's health, while the external locus of control corresponds to one's opinion on the dependence of his/her health on such external factors as luck, chance, or other individuals [11]. Although, individuals with an internal locus of control take responsibility for their health and make rational nutritional choices more frequently than those with an external locus, the results of studies dealing with the problem in question are inconclusive [7, 11, 12]. Consequently, we examined the predictive role of the locus of health control with regards to the nutritional behaviors of pregnant women.

The aim of this study was to analyze the consumption frequency of selected food products depending on the locus of health control in a group of pregnant women residing in a small town and rural setting in Małopolska district.

MATERIAL AND METHODS

The study was conducted between 2010 and 2012 in a group of 300 pregnant women from Małopolska

region, who were between 20 and 40 years of age (29.02 ± 6.33) and in the 2nd or 3rd trimester of pregnancy, constituting 27% and 73% of participants, respectively. The study included women from villages and towns up to 30 000 in Bochnia, Cracow, Tarnow, and Wadowice region. Sociodemographic analysis of this group revealed the predominance of women with secondary (46%) and post-secondary education (26%), and a relatively lower fraction of participants with vocational education (28%). The analyzed group included 135 (45%) primiparas, as well as 81 (27%) and 84 (28%) women in their second or third pregnancy, respectively. As no significant differences in terms of nutritional behaviors were documented between women who resided in a small town and rural setting, these two subgroups were analyzed together. The dietary choices of participating women were examined with a prepared questionnaire, which was assessed for psychometric reliability; its *Cronbach's alpha*-coefficient was calculated as 0.77. The frequency of consumption of various food products was analyzed using a 7-item scale containing the following categories: several times a day (corresponding to 7 points), once a day (6 pts), 4-5 times a week (5 pts), 2-3 times a week (4 pts), several times per month (3 pts), once a month (2 pts), and rarer/never (1 pt). The locus of health control was determined with the standardized Multidimensional Health Locus of Control (MHLC) scale developed by *Wallston et al.* and adapted by *Juczyński* [12]. The MHLC scale comprises 18 diagnostic statements describing three dimensions of the health locus of control: internal (I), powerful others (P), and chance (C), assuming that control over health corresponds to self-influence (I), influence of others (P), or chance/external conditions (C) [12]. Powerful others and chance are acknowledged as representing external locus of health control. The scores of each subscale can range from 6 to 36 points; the higher the score the stronger is self-perceived influence of a given factor on one's health. According to widely accepted methodology [12], median value of each subscale was considered a cut-off value between low and high scores. The respective median values for the groups examined by our study were found to be 27 (MHLC-I), 25 (MHLC-P), and 21 points (MHLC-C).

Statistical analysis of results was conducted with STATISTICA 10.0 (Windows) software. The relationship between the MHLC scale and the frequency of consumption of various products was estimated on the basis of *Spearman's* coefficients of rank correlation.

The frequencies of consumption of particular products associated with various MHLC dimensions were compared with the *Mann-Whitney U* test. Test probability was considered significant at $p < 0.05$.

RESULTS

Fruits and white bread constituted the food products that the examined pregnant women consumed most frequently, i.e. daily. Furthermore, they drank mineral water on a daily basis and ate butter and dairy products at least 4-5 times per week. The list of products that were consumed several times a week included cooked and raw vegetables, meat, poultry, and pork sausages, high-fat milk, fermented dairy products, cheese, and sweets and pastry. The examined women ingested whole wheat bread, eggs, high-fat cottage cheese, and margarine nearly 2-3 times per week. The remaining food products were chosen less frequently; the least frequently chosen products, eaten less than once a month, included fish with edible skeleton and seafood (Table 1).

Statistical analysis revealed that MHLC-I was positively, albeit weakly, correlated with the consumption frequency of orange and red vegetables ($p < 0.01$), marine fish ($p < 0.01$), and seafood ($p < 0.05$), and inversely correlated with the ingestion of margarine ($p < 0.05$). The scores of MHLC-P had a significant positive, although weak, correlation with the consumption frequency of cheese ($p < 0.01$), salted snacks ($p < 0.01$), and fast food products ($p < 0.01$), and significant inverse correlation with the ingestion of whole grains ($p < 0.01$), oat meal ($p < 0.01$), pork and pork sausages ($p < 0.05$), and eggs ($p < 0.01$). Higher values of MHLC-C scale were associated with significantly reduced frequency of consuming whole grains ($p < 0.01$), oat meal ($p < 0.01$), marine fish ($p < 0.05$), nuts ($p < 0.01$), and vegetable or fresh fruit juices ($p < 0.05$) (Table 2).

Food products with statistically significant differences in the average frequency of consumption between groups of women with various intensities (high vs. low) of particular loci of health control (MHLC scale) are listed in Table 3. Women with higher levels of internal control (MHLC-I) chose orange and red vegetables ($p < 0.001$), fresh fruit juices ($p < 0.05$), and seafood ($p < 0.0001$) significantly more frequently, and consumed low-fat milk significantly less frequently ($p < 0.01$), than women with lower internal control. Women with stronger powerful others locus of control (MHLC-P) consumed yogurts ($p < 0.05$), low-fat cottage cheese ($p < 0.01$), cheese ($p < 0.01$), and salted snacks ($p < 0.001$) significantly more frequently, and selected whole grains ($p < 0.05$) and pork/pork sausages ($p < 0.05$) less frequently, than women with lower MHLC-P scale scores. Women with higher scores of chance locus of control

significantly more frequently ingested salted snacks ($p < 0.05$), and significantly less frequently chose whole grains ($p < 0.0001$), oat meal ($p < 0.0001$), sweetened cereals ($p < 0.05$), pork and pork sausages ($p < 0.05$), and fresh fruit juices ($p < 0.01$) (Table 3).

Table 1. Consumption frequency of various food products in the group of pregnant women (descriptive statistics)

Food products	Descriptive statistics						
	X	SD	Min	Q25	Med	Q75	Max
White bread	5.6	1.4	1	5	6	6	7
Whole wheat bread	3.8	1.7	1	2	4	6	7
White rice	3.1	0.7	1	3	3	3	5
Brown rice	2.0	0.9	1	1	2	3	5
Whole grains	2.3	1.0	1	2	2	3	5
Oat meal	2.3	1.4	1	1	2	3	6
Sweetened cereals	2.5	1.4	1	1	2	3	6
Fresh fruits	5.7	1.2	1	5	6	7	7
Raw vegetables	4.4	1.6	1	3	4	6	7
Cooked vegetables	4.8	1.3	1	4	5	6	7
Orange and red vegetables	4.7	1.2	1	4	5	6	7
Pork and pork sausages	4.4	1.2	1	4	4	5	7
Poultry and poultry sausages	4.5	1.1	1	4	4	5	7
Marine fish	3.1	1.0	1	3	3	4	6
Fish with edible skeleton	1.8	0.8	1	1	2	2	4
Seafood	1.5	0.8	1	1	1	2	6
Eggs	3.8	1.1	1	3	4	4	7
Dairy products overall	5.2	1.2	2	5	5	6	7
High-fat milk 3.2%	4.3	1.8	1	3	4	6	7
Low-fat milk 1.5-2.0%	2.7	1.9	1	1	2	4	7
Natural and fruit yoghurts	4.2	1.3	1	3	4	5	7
High-fat cottage cheese	3.5	1.3	1	3	4	4	6
Low-fat cottage cheese	3.3	1.4	1	2	3	4	6
Cheese	4.1	1.2	1	4	4	5	7
Sweets and pastry	4.0	1.5	1	3	4	5	7
Salted snacks	2.5	1.0	1	2	2	3	6
Fast food products	2.2	0.8	1	2	2	3	6
Nuts, almonds	3.0	1.4	1	2	3	4	7
Olive oil and other plant oils	3.0	1.5	1	2	3	4	6
Butter	5.3	1.6	1	5	6	6	7
Margarine	3.5	1.8	1	2	3	5	7
Fruit juices	4.9	1.4	2	4	5	6	7
Fresh fruit juices	3.5	1.4	1	3	3	4	7
Vegetable juices	2.3	1.2	1	2	2	3	7
Sweetened soft drinks	2.6	1.1	1	2	2	3	6
Mineral water	6.3	1.1	1	6	7	7	7

X- Mean, SD- Standard Deviation, Min- Minimum, Max- Maximum, Med- Median, Q25- Lower quartile, Q75- Upper quartile

Table 2. Correlations between MHLC-I, MHLC-P, and MHLC-C scales and the consumption frequency of various products in the group of pregnant women

Food products	Spearman's coefficients of rank correlation		
	MHLC- I	MHLC- P	MHLC- C
White bread	-0.010	-0.091	-0.014
Whole wheat bread	0.020	0.029	0.008
White rice	0.064	0.009	0.020
Brown rice	0.108	0.018	0.016
Whole grains	-0.047	-0.166**	-0.286**
Oat meal	-0.078	-0.196**	-0.344**
Sweetened cereals	-0.009	-0.081	-0.067
Fresh fruits	-0.109	-0.038	-0.072
Raw vegetables	0.032	-0.026	-0.063
Cooked vegetables	-0.034	0.065	-0.078
Orange and red vegetables	0.206**	0.047	-0.013
Pork and pork sausages	-0.034	-0.137*	-0.057
Poultry and poultry sausages	-0.088	0.056	0.019
Marine fish	0.197**	-0.051	-0.136*
Fish with edible skeleton	-0.033	-0.075	0.019
Seafood	0.145*	-0.057	-0.058
Eggs	-0.046	-0.165**	0.014
Dairy products overall	-0.024	-0.058	-0.067
High-fat milk 3.2%	0.064	-0.095	0.020
Low-fat milk 1,5- 2,0%	-0.099	-0.091	-0.047
Natural and fruit yoghurts	0.003	0.069	0.038
High-fat cottage cheese	0.014	0.006	-0.001
Low-fat cottage cheese	0.095	0.108	-0.027
Cheese	-0.011	0.198**	0.051
Sweets and pastry	-0.017	0.083	0.000
Salted snacks	-0.012	0.316**	0.126*
Fast food products	-0.047	0.160**	0.090
Nuts, almonds	-0.098	-0.108	-0.163**
Olive oil and other plant oils	-0.013	0.012	0.028
Butter	-0.063	-0.001	0.027
Margarine	-0.114*	0.004	0.026
Fruit juices	-0.024	0.029	-0.105
Fresh fruit juices	0.112	-0.086	-0.186**
Vegetable juices	0.016	-0.034	-0.162**
Sweetened soft drinks	-0.042	0.013	0.093
Mineral water	0.041	0.001	0.043

* $p < 0.05$, ** $p < 0.01$

DISCUSSION

Our study revealed that adherence to qualitative dietary recommendations in a group of pregnant women residing in a small town and rural setting is limited, and the locus of health control is related to the consumption frequency of certain food products.

Comparison between the nutritional choices of the studied women and the actual nutritional recommendations revealed insufficient consumption of whole

grain cereals, vegetables and fruits, dairy products, fish, plant oils, olive oil, and nuts, along with the excessive ingestion of sweets and pastry. The nutritional mistakes revealed by our study correspond to those previously reported in pregnant women [6, 8, 9, 10, 13, 20, 23]. The preference for purified cereals and low consumption of whole grain cereals by the examined women limited the ingestion of vitamin B complex and dietary fiber; as the latter component reduces the energy value of the diet, its deficiency may be associated with increased risk of complications resulting from high glycemic index and load of consumed products. Additionally, the absence of several servings of vegetables and fruits increased the risk of potassium and magnesium deficiency, as well as the risk of insufficient consumption of dietary fiber and vitamins, including antioxidants [24]. In the case of vegetables, the examined women most frequently chose orange and red vegetables, which constitute a rich source of bioactive compounds, such as antioxidant vitamins and polyphenols, both of which inactivate free radicals. High consumption of vegetables and fruits by pregnant women is vitally important, also in view of their positive influence on birth weight and other somatic parameters of neonates, as well as reducing the risk of preeclampsia [4, 14, 16, 22]. Insufficient consumption of calcium-rich dairy products, particularly during the 2nd and 3rd trimester, may lead to reduced bone mineral density of neonates and maternal osteomalacia, and affect the risk of pregnancy-induced hypertension [24]. Low frequency of fish consumption, recommended especially in the 3rd trimester in view of the role played by long-chain fatty acids (mostly DHA) in normal development of brain and retina, should also be considered as a negative finding [17, 24]. Deficiency of omega-3 fatty acids in the dietary intake of pregnant women was also previously reported in Mexico [20]. Relatively high consumption frequency of sweets and pastry, i.e. products characterized by high energy density and containing trans-isomers of fatty acids, could potentially increase the risk of excessive weight gain, gestational diabetes, and preeclampsia, all representing threat to maternal and fetal health [17, 24, 26].

Moreover, our study demonstrated the presence of a relationship between the locus of health control and certain nutritional choices of pregnant women. As expected, positive correlation was documented between the internal locus of control and consumption of orange and red vegetables ($p < 0.01$), marine fish ($p < 0.01$), and seafood ($p < 0.05$). Additionally, the comparative analysis of average consumption frequency in the group of women with lower and higher level of internal control revealed that this latter group was characterized by higher consumption of fresh fruit juices ($p < 0.05$). These results, corresponding to more rational nutritional choices of women possessing an internal

Table 3. Frequency consumption of various food products depending on the levels of MHLC-I, MHLC-P, and MHLC-C scales in the group of pregnant women

Food products	H/L	MHLC- I			MHLC- P			MHLC- C		
		X	SD	p	X	SD	p	X	SD	p
Whole grains	L	2.38	0.98	0.644	2.46	0.89	0.019	2.61	0.87	<0.000
	H	2.30	0.92		2.21	1.00		2.06	0.96	
Oat meal	L	2.43	1.35	0.101	2.40	1.38	0.273	2.71	1.44	<0.000
	H	2.23	1.40		2.27	1.37		1.96	1.20	
Sweetened cereals	L	2.54	1.43	0.784	2.52	1.41	0.843	2.61	1.30	0.040
	H	2.45	1.34		2.48	1.37		2.39	1.47	
Orange and red vegetables	L	4.50	1.18	0.000	4.67	1.16	0.281	4.76	1.04	0.833
	H	5.02	1.16		4.79	1.25		4.69	1.35	
Pork and pork sausages	L	4.43	1.30	0.281	4.48	1.07	0.014	4.51	1.15	0.023
	H	4.27	1.10		4.23	1.35		4.20	1.27	
Seafood	L	1.27	0.48	<0.000	1.46	0.75	0.937	1.53	0.94	0.499
	H	1.73	1.06		1.48	0.89		1.41	0.67	
Low-fat milk 1.5- 2.0%	L	2.91	1.89	0.002	2.71	1.89	0.690	2.82	1.98	0.681
	H	2.41	1.82		2.67	1.86		2.55	1.74	
Natural and fruit yoghurts	L	4.23	1.44	0.784	4.08	1.46	0.035	4.18	1.33	0.347
	H	4.18	1.22		4.35	1.20		4.24	1.37	
Low-fat cottage cheese	L	3.27	1.29	0.481	3.08	1.24	0.001	3.37	1.38	0.608
	H	3.41	1.42		3.60	1.42		3.29	1.33	
Cheese	L	4.09	1.14	0.729	3.88	1.11	0.008	4.04	1.35	0.304
	H	4.09	1.32		4.31	1.30		4.14	1.07	
Salted snacks	L	2.43	0.80	0.569	2.25	0.83	0.000	2.41	1.07	0.022
	H	2.61	1.27		2.79	1.16		2.61	0.99	
Fresh fruit juices	L	3.29	1.31	0.021	3.56	1.45	0.208	3.71	1.42	0.001
	H	3.66	1.50		3.33	1.35		3.18	1.34	

H- high, L- low level of health control in MHLC-I, MHLC-P, and MHLC-C scale; X- Mean, SD- Standard Deviation; P- statistical significance of differences in the Mann-Whitney U test

locus of control, are consistent with the features of this dimension of health control, indicating that these individuals share a conviction on the influence of their choices, including nutritional choices, on their health [11, 12]. The internal locus of health control, reflected by more frequent consumption of recommended products, promoted higher supply of antioxidants, minerals, dietary fiber, and *omega-3* fatty acids. Furthermore, lower consumption frequency of margarines amongst women with strong internal locus of health control favored lower supply of trans-isomers of fatty acids, which are particularly contraindicated in pregnancy. It was also not surprising that higher levels of external control, i.e. the influence of powerful others and/or chance, was associated with lower consumption frequency of recommended products including whole grains ($p<0.01$), oat meal ($p<0.01$), marine fish ($p<0.05$), nuts ($p<0.01$), and fresh fruit and vegetable juices ($p<0.01$), as well as with increased ingestion of non-recommended products, such as salted snacks ($p<0.05$), and other fast food products ($p<0.01$). These observations correspond to self-conviction typical for such individuals, namely

that their health is not affected by their health-related choices or the influence of the others, including medical personnel [11, 12]. It should be noted, however, that higher influence of powerful others was related to lower consumption frequency of pork and pork sausages ($p<0.05$), both rich in atherogenic fatty acids, and higher ingestion of calcium-rich cheese ($p<0.01$). Furthermore, it was revealed that women with strong powerful others locus of control significantly more frequently chose fermented dairy products ($p<0.05$), and low-fat cottage cheese ($p<0.01$), both recommended in pregnancy, particularly during the 2nd and 3rd trimester. This finding could be interpreted as a positive influence of the others, including medical personnel, on defining rational nutritional behaviors. More favorable picture of the food choices in women with internal control along with less unequivocal influence of powerful others justify the need for health education, including nutrition, due to the positive impact of reliable, validated educational programs on enhancing internal locus of health control [2]. Previous studies have indicated that self-efficacy has a higher predictive value than the locus of control in

determining health behaviors; however, it was suggested that these two parameters should be analyzed together [1]. Therefore, an unambiguous determination of these relationships, vital for human health culture, requires further research, including the use of the Multidimensional Health Locus of Control Scale as a reliable tool in predicting and modifying health behaviors [15].

CONCLUSIONS

1. Qualitative nutritional mistakes limited the nutritional and health value of dietary intake of pregnant women residing in a small town and rural setting.
2. Our study revealed the presence of a relationship between the locus of health control and the nutrition of pregnant women. In particular, we showed that women with the internal control made more rational nutritional choices as compared to those with the external control.
3. Amongst women with high level of external control, more favorable dietary choices were made by those with powerful others rather than by those with the chance locus of control.

Conflict of interest

The author declare no conflict of interest.

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