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ORIGINAL PAPER

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Evaluation of food offered in schools and bought by students in Rzeszów

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ABSTRACT

Introduction. According to epidemiologic research, the number of obese and overweight children is increasing. A common way of dealing with this problem is enacting legislation regarding food served in educational institutions. In Poland, the regulations regarding the assortment of school shops are contained in the Ordinance of the Minister of Health of 26th June 2015 (and its subsequent amendments).

Aim. The main aim of this study is to evaluate the product range of school shops and vending machines in Rzeszów.

Methods and materials. The study covered 52 primary and secondary schools in Rzeszów. The schools included in the study had 15568 students altogether. Products bought by students in school shops and vending machines were recorded over the period of 3 days.

Results. The study has shown a statistically significant relationship ($p < 0.001$) between the amount and types of products bought in primary and secondary schools. Healthy snacks only made up a small percentage of products sold. Secondary schools sold 20% more snacks with high sugar content compared to primary schools. A majority of products sold were compliant with regulations ($p=0.12$).

Conclusions. The assortment of school shops has changed after the implementation of the Ordinance of the Minister of Health of 26 June 2015 (and its subsequent amendments). The newly introduced restrictions significantly narrowed down the range of products offered in schools, reducing the number of products containing more than 15g of sugar (13.5g per 100g/ml in case of dairy products) or 10g of fat per portion.

Keywords. nutritional habits, childhood and adolescent obesity, public health

Introduction

Childhood is a vital phase in human development. The processes taking place in a person's body during preschool and school years determine the quality of their life in later stages. Correct development of the organism requires a balanced diet, which stimulates somatic and motoric development in early years of life and is the fundamental element of "diseases of affluence" prevention.

According to epidemiologic research, the amount of obese and overweight children has increased over the last

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years. In the 1st quarter of 2017 the number of obese people in the world stood at around 670 million. Worldwide, 2.6 million people per year die due to obesity or excess weight.[1-3] The problem involves all social groups, affecting the appearance of disorders with a metabolic background, such as: high blood pressure, type 2 diabetes, atherosclerosis on a great scale.[4-9] These medical conditions are currently being called the "diseases of affluence." Research involving 12,491 people show that an average of 70% of children with excess weight become obese adults.[10]

Guardians and the environment during childhood have an enormous impact on the nutritional habits of children and teenagers.[11-12] Another factor is the propagation of different diets though widely accessible media, such as the internet (1 in 4 Poles uses these media).[13-17]

Countries all around the world undertake initiatives aiming to decrease the number of overweight students. Many educational programs are created to help prevent the above mentioned diseases and propagate a correct way of eating. A common way of dealing with excess weight and obesity is passing laws regarding the food that may be sold in educational institutions. Both European and worldwide organizations (such as WHO - World Health Organization) publish solutions which could decrease the number of obese children.[18-23]

In Poland, the law regarding the range of products in shops and vending machines located in educational institutions is regulated by the Ordinance of the Minister of Health of 26th June 2015 (with later changes). It concerns the types of food and snacks that may be sold in schools and the requirements that have to be met by the products used to feed the children and teenagers in schools.[24]

In previous years, the assortment of school shops was characterized by lack of legal restrictions. The alteration of regulations in 2015 resulted in a big change. The majority of highly processed food had to disappear from school shop shelves.[25] The situation caused public objection and a media outburst. 390 press publications mentioned the subject.[26]

After a year, the regulations were made less stringent through the novelization of the Ordinance of the Minister of Health of 26th August 2015 which occurred on 26th June 2016.

Aim

The main aim of this study is to evaluate the product range of shops and vending machines in the schools of Rzeszów.

The study also aims to show whether the assortment of those shops and vending machines has been adjusted to the criteria contained in the new regulations.

Materials and methods

The study included 52 schools (primary and secondary) in Rzeszów that teach a total of 15568 students (10317 in primary schools and 5251 in secondary schools). Some of the institutions were school complexes. According to the collected data, 4 shops included in the study have gone bankrupt after the change in regulations in 2015. Ultimately, 16 shops were subjected to the study. In 5 schools, next to the shop, there was a canteen serving hot meals.

Each vendor was asked to take notes of the amount of sold products of different kinds. During each break, the vendors took record of products bought by students. The notes were taken in a table designed for this purpose which contained a list of products based on information from literature published before the imposition of the Ordinance of the Minister of Health of 26th August 2015.[27] The data was recorded over a period of 3 days.

Products were then classified into 8 groups:

- Products with high sugar content - snacks containing more than 15g added sugar per portion; candy, cookies, lollipops, gum, jellybeans, fruit bars, sweetened drinks, sodas, flavored milk and water, mousses, juices, coca, muesli.
- Products with high fat content; open sandwiches (baguettes), savory pastries, braided bread.
- Products with high sugar and fats content; bars, sesame crackers, sweet buns and other sweet pastries, compound chocolate products and waffles.
- Products with high salt content; salted peanuts.
- Products with high fats and salt content; pretzels, crackers, chips, breadsticks, popcorn, corn puffs with added spice mixes.
- Products with low nutritional value (containing a trifling amount of nutrients) - waffles, rice waffles, puffed rice.
- Appropriate snacks (higher nutritional value compared to products from other categories, lack of substances that could negatively affect the organism); kefir, natural yoghurt, fresh salads (without dressings), wholegrain buns, fresh (quality) sandwiches, fresh and dried fruit.
- Bottled water.

The analysis also included products found in vending machines located in schools. The data was verified with the help of the owners of vending machines.

Analysis of the empirical data was conducted with the chi-squared test which was used to determine whether there is a statistically significant relation between the variables ($p \leq 0.05$).

Results

The amounts of sold products of different groups in primary and secondary schools with reference to the number of students are shown in Table 1.

The research shows a significant correlation between primary schools and secondary schools, in the

amount of sold products of different types ($p < 0.001$).

The products most frequently bought by secondary school students were sweet buns (with or without filling). Sweet buns, sold by 80% of secondary schools, made up 45.47% of sold products. Secondary school students bought almost 50% more sweet buns compared to other, healthier snacks.

The second most popular product was bottled still water, which attributed to over 30% of the assortment. Sparkly water was 60% less frequently bought compared to still water. The percentage of sold juices was 26.11%, which is almost 19% less in comparison to sold sparkly water. Fruit mousses and pulp juices made up 20% of all sold products. Sodas such as Coca-Cola were only available in one of the schools (a sport-profiled secondary school).

The third group of most-sold products were lollipops, making up 30% of products bought by secondary school students. The school shops did not offer dragée, jellybeans or ice cream.

The results of the study show that students preferred highly processed products with high sugar, fats or salt content.

Products containing excess sugar were frequently bought. Lollipops were in the assortment of 60% of primary schools subjected to the observation. They were bought in the amount of 20.33% per student. More lollipops were sold in secondary schools (33.82%). Chocolate bars were more popular than fruit bars. "7 Days" croissants were only available in one of the schools included in the study.

Among sweetened drinks, the most frequently bought group of products were "100%" juices, the second most-popular group of products were fruity drinks and the third group - pulp juices ("Kubuś"). Students did not buy flavored water, flavored milk or fruit mousses very often. Sodas were not sold in any school shop in the schools subjected to observation.

Students also preferred to buy sweet buns. Primary school students bought sweet buns over 50% more often than braided bread.

The study showed that students often bought products with high salt content, such as chips, breadsticks and popcorn.

Fresh sandwiches and fruit were the most popular healthy snacks. Students bought nuts and dried fruit less often. Salads were rarely offered in school shops ($n = 2$) and only made up 2.36% of sold products.

No shops sold pretzels, waffles, crackers or puffed rice.

In primary schools, the amount of sold products with high sugar content almost equaled the number of students (close to 1 product per student). In secondary schools, products of that type were sold 20% more often (with reference to the number of students).

Table 1. Amounts of products sold in schools with reference to the number of students

Product	Products sold per 1 student (%)	
	Primary schools	Secondary schools
Products with high sugar content		
flavored milk	7.32	0.10
100% juices	13.96	26.11
fruity drinks	12.10	11.84
fruity mousses	6.64	8.13
pulp juices (Kubuś)	8.63	7.49
chewing gums	19.67	22.17
lollipops	20.33	33.82
cookies	10.14	1.65
candy	1.40	1.48
sweetened muesli	2.65	3.14
sodas	0.00	1.32
flavored water	7.38	2.71
Products with high sugar and fats content		
compound chocolate products	0.55	0.39
sweet buns	8.11	45.47
chocolate bars	5.05	6.52
7-Days	2.40	2.61
fruity bars	6.04	4.45
sweet wafer-cakes	1.07	0.00
ladyfingers	1.89	0.00
biscuits	1.04	0.00
sesame crackers	0.00	0.48
filled doughnuts	0.00	2.10
Products with high fats and salt content		
corn puffs	10.55	17.88
chips	2.19	10.20
breadsticks	10.82	6.16
popcorn	10.68	9.04
crackers	0.19	0.00
pretzels	0.41	0.00
Products with high fats content		
savoury pastries	2.84	0.61
braided bread	4.13	2.84
open sandwiches (baguettes)	0.96	0.00
Products with high salt content		
peanuts (salted)	0.25	0.00
Snacks with low nutritional value		
rice waffles	5.90	6.00
waffles	7.95	6.68
puffed rice	0.05	0.00
Appropriate snacks		
high-quality fresh sandwiches	14.94	24.91
fruit	6.07	7.03
dried fruit	3.01	4.94
nuts and dried fruit mixes	4.37	4.74
natural yoghurts	1.91	0.39
kefirs	0.03	0.03
fresh salads with no dressing	0.00	2.36
Bottled water		
still water	24.59	32.11
sparkling water	15.14	17.36

Source: own elaboration.

Table 2. Amounts of products from different groups sold in schools with reference to the number of students

Group of products	Primary schools - 3660 students		Secondary schools - 3099 students	
	Amount of sold products	Products sold per student (%)	Amount of sold products	Products sold per student (%)
high sugar content	3616	98.80	3665	118.26
high fats content	186	5.08	88	2.84
high fats and sugar content	1332	36.39	1973	63.67
high salt content	9	0.25	0	0.00
high salt and fats content	1423	38.88	1360	43.89
low nutritional value	507	13.85	393	12.68
appropriate snack	1110	30.33	1376	44.40
bottled water	1454	39.73	1533	49.47
Sum	9637		10388	

Source: own elaboration.

Table 3. Percentages of products from different groups sold in primary and secondary schools

Group of products	Primary schools		Secondary schools	
	Amount of products	Percentage out of all sold products (%)	Amount of products	Percentage out of all sold products (%)
high sugar content	3616	37.52	3665	35.28
high fats content	186	1.93	88	0.85
high fats and sugar content	1332	13.82	1973	18.99
high salt content	9	0.09	0	0.00
high salt and fats content	1423	14.77	1360	13.09
low nutritional value	507	5.26	393	3.78
appropriate snacks	1110	11.52	1376	13.25
bottled water	1454	15.09	1533	14.76
Sum	9637	100	10388	100

Source: own elaboration.

Table 4. Percentages of sold products compliant and non-compliant with the law

	Primary schools		Secondary schools	
	Amount of sold products	Percentage out of all sold products (%)	Amount of sold products	Percentage out of all sold products (%)
Products compliant with regulations	8704	90.32	9448	90.95
Products non-compliant with regulations	933	9.68	940	9.05
Sum	9637	100	10388	100

Source: own elaboration.

Appropriate (healthy) snacks were sold 15% more often in secondary schools than in primary schools.

Bottled water was sold more often in secondary schools (48.47%) than in primary schools (39.73%). Table 2. shows the amount of sold products from different groups in primary and secondary schools with reference to the number of students.

Most distinct correlations were observed in the amount of sold products with high sugar and fats content. Secondary school students bought around 5% more of this type of product compared to primary school students (sold products per student). Table 3. shows a comparison between primary and secondary schools with regard to the amount of sold products of different types and the frequency of purchases (with regard to the number of students).

A majority (90.32%) of sold products were compliant with the law. Analysis with the use of chi-squared test did not show a statistically significant correlation between primary and secondary schools, concerning the amount of sold products compliant and non-compliant with the law. Table 4. shows the amounts of sold

products that were compliant and non-compliant with the regulations and what percentage of all products they made up.

Students of 4 primary schools and 5 secondary schools were able to buy food both from shops and vending machines.

Vending machines were located in 16 schools out of 52 included in the research. The number of machines varied between 1-3. Usually there were 2 machines per school.

Interpretation of gathered data was difficult due to the method used while placing products in the machines.

Observation showed that 75% of vending machines offered sweet drinks, sweets snacks and savory snacks. Sweet snacks included "7 Days" croissants, bars, waffles, cakes. Some machines offered dragée or sesame crackers. Savory snacks included breadsticks, crackers, pretzels, crisps and flavored peanuts. As opposed to school shops, the vending machines offered sweetened drinks.

The above mentioned products are non-compliant with the Ordinance of the Minister of Health of 26 June 2015 (and its subsequent amendments) and were not approved for sale in schools. Majority of products had high caloric value and contained high amounts of sugar, fats and salt. Such snacks took up 50% of the machine.

Some machines offered products not mentioned in the Ordinance of the Minister of Health of 26 June 2015 (and its subsequent amendments). 25% of machines sold snacks of lower sugar, fats and salt content and lower food energy. These machines offered mostly fruit juices, breadsticks, muesli bars and flavored water. Moreover, owners of the vending machines claimed to be selling chips made of dried fruit and vegetables, fruit and nut mixes, sunflower seeds, peanuts, rice/corn/spelt waffles, flavored soy milk. All of these products were compliant with the regulations. They contained less than 15g of sugar, 10g of fats and 1g of salt per a 100 g/ml portion.

Discussion

According to literature, during their time in school, majority of students consumes food acquired from the school shop. Research conducted by Gajda et al. indicates that over 80% of children shop in school shops. Wawrzyniak's analysis shows that this percentage equals 97.9%.[28-29]

The students choice of a snack may be influenced by how much pocket money they get. According to own observations, prices of most products varied between 0.3-2.5 zł. Urbańska's analysis shows that majority of students received enough money to buy different products in school shops. Low retail prices of products sold in school shops encourages the students.

The most popular products sold in portions in school shops in Rzeszów were candy and cookies. According to research published by Wawrzyniak et al., students attending school in the suburbs consumed food from school shops which averagely providing 912 calories out of their daily caloric intake needs. In schools in the city this amount was even higher, standing at 1000 calories, which makes up almost 40% of an average daily caloric intake of a student.

The amount of juices bought by students in Rzeszów recorded in this study is higher than the amounts from previous years (20% higher in primary schools and 40% higher in secondary schools). Szymandera-Buszka's studies showed a similar result. The juices sold in school shops contain sugars added by the producer. Juices promoted as "100% juices" are the primary source of simple sugars.[30-31]

According to APP (American Academy of Pediatrics) recommendations, the children need to be educated about the superiority of fresh juices over sweetened juices.[32] The HBSC report from 2016 shows that 25% of interviewed respondent drinks artificially sweetened sparkly drinks. Meta-analysis shows that the consumption of sweetened drinks affects the body mass.[33-36]

After the introduction of The Ordinance of the Minister of Health of 26th June 2015, there has been a positive change in the amount of consumed sodas. Beverages of that type were in previous years often bought by children.[37-40] Urbańska's and Zynarska's studies (before the regulation was introduced) showed that children drink sweetened drinks almost daily. According to Wakmańska, this type of beverage was consumed by 60% of children.[41]

After the regulations were introduced, this amount decreased. This year, only one of schools subjected to this study sold sodas.

The literature from previous years shows the presence of energy drinks in school shops. This year there were no energy drinks in the school shops subjected to the study.

Students of primary and secondary schools in Rzeszów frequently (7.32%) bought flavored milk drinks, which contains added sugar.

Flavored water was sold in over 33% of school shops in Rzeszów. From a nutritionist's point of view, water should not provide energy or be a source of simple sugars.

Despite the introduction of The Ordinance of the Minister of Health of 26th June 2015 (and its subsequent amendments), students are still able to buy sweets. Snacks from this group (sweet buns, bars, lollipops) were frequently bought. Sweet buns were the most popular snacks (in secondary schools), available in every school shop. In secondary schools, sweet buns were chosen twice as often as regular sandwiches, which is an unsettling fact.

In some shops, which did not comply with the regulations (10%), the students could still buy "7 Days"

croissants, chocolate bars or muesli containing more than 15g of sugar per 100g.

During the production of snacks such as sweet buns, candy, chocolates, pretzels and cakes, producers often use palm oil. Hardening of this oil may involve creation of substances claimed as potentially cancerogenic.[42-43]

The amount of high-calorie snacks in school shops has decreased in previous years. The newly introduced restrictions significantly narrowed down the range of products in school shops, decreasing the number of products containing over 15g of sugar per 100g/ml, 10g of fats per 100g/ml or 13,5g of sugar in case of milk products. The shops stopped selling jellybeans, fruity chewing gum and dragée, which have previously been bought very often. The shops also decreased the range of chocolate bars.

Children and teenagers spend most of their day at school. The daily time spent in educational institutions is averagely between 4-8 hours. During breaks between lessons the students feel hungry, which can cause difficulties with focusing.

Typical short breaks take 5-10 minutes and there is one longer break that lasts 20 minutes.

A country that has successfully resolved the issue of students having little time to eat is Macedonia. The teachers are legally obliged to provide students with at least 15 minutes for snacks and 30 minutes for a bigger meal.[44] In Poland, school principals decide how much time students have to have a meal at school.

Not enough time for students to buy and eat a meal means they would rather buy snacks in vending machines. Convenience of use, wide range of products and relatively low prices encourage students to buy from vending machines rather than eat other meals. An evaluation made by NIK (Najwyższa Izba Kontroli) has shown that 87% vending machines in schools in Wrocław offers products with low nutritional value such as sweet drinks, chips, candy bars. A high percentage of schools reports a need for stricter control of food offered in shops and vending machines.[45]

Mass media, occurring mostly in a form enabling communication, are used by around 1 in 4 Poles. Among people aged 12-15, the most popular are Internet media such as chats, forums, messengers and blogs. A possible influence are also: television, films or video games.

According to a research done by GUS in 2016, children (aged 2-14) averagely spend 2 hours and 20 minutes daily using media. Boys usually spend more time on media than girls. According to the study, 25% of children spent 1 hour a day using media, 20% of children spent close to 2 hours daily using media and 12.5% of children used media for almost 4 hours a day. An average child watches close to 40,000 advertisements per year, which takes up around 333 hours. Around 95% of advertisements in Great Britain promote sweets or other food products containing a lot of sugar. Currently in Poland it is forbidden to place such advertisements on school grounds.[46-47]

Propagating healthy nutrition in schools can be possible with the use of different marketing techniques. According to research from 2016, the use of such techniques greatly increased the consumption of vegetables among primary school students. The aim of the above mentioned research was to investigate whether there is a correlation between the daily exposure to materials promoting vegetable consumption and the nutritional choices of students. Banners depicting vegetables were placed in 10 British schools over the period of 6 weeks. Also, some teachers played short videos with a "vegetable hero" as the lead. As a result of hanging the vegetable posters, 90.05% more children chose vegetables as a snack. In groups that additionally watched vegetable videos, 239.2% more children chose vegetables.[48]

Numerous research indicate that an unhealthy was of eating in childhood increases the risk of metabolic disorders in later years of life.[49-50]

Children develop different eating habits as a result of spending time out of their home and becoming independent. The quality of children's diets depends on the nutritional policy - a correct health-promoting policy can cause a decrease in the number of overweight and obese people. Lack of nutritional education means poor awareness of correct nutrition. Propagating proper diet can involve different forms. It is vital to create ways to change the unhealthy habits of young people.

Conclusions

1. The newly introduced restrictions significantly narrowed down the product range in school shops, eliminating products containing over 15g of sugar, 10g of fats per a 100g portion (or over 13.5g of sugar per 100ml in drinks). Shops stopped selling jellybeans, fruity gum, dragée and reduced the amount of sold sodas, chocolate bars and chips.
2. Despite the enactment of the Ordinance of the Minister of Health of 26th June 2015 (and its subsequent amendments), students continued to buy highly processed snacks. Most popular were sweet snacks, making up 33% of the assortment of shops in primary and secondary schools.
3. Around 20% more products with high sugar content were sold in secondary schools compared to primary schools.
4. Snacks characterized by a high nutritional value and lack of potentially harmful substances made up a small percentage of all products sold in schools in Rzeszów.
5. A statistically significant relation ($p < 0.001$) was shown between products of different types sold in primary and secondary schools.

6. No statistically significant relation (p = 0.12) was shown between the amount of sold products compliant and non-compliant with the regulations.
7. A high percentage of vending machines (75%) offered sweet drinks, sweets and savoury snacks. Highly processed food usually took up 50% of the machine.

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