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Factors within the family environment such as parents' dietary habits and fruit and vegetable availability have the greatest influence on fruit and vegetable consumption by Polish children

Katarzyna Wolnicka[1,*], Anna Małgorzata Taraszewska[1], Joanna Jaczewska-Schuetz[1] and Mirosław Jarosz[2]

[1]Department of Nutrition and Dietetic with Clinic of Metabolic Diseases and Gastroenterology, Division of School Nutrition, National Food and Nutrition Institute, ul. Powsińska 61/63, 02-903 Warsaw, Poland: [2]Department of Nutrition and Dietetic with Clinic of Metabolic Diseases and Gastroenterology, National Food and Nutrition Institute, Warsaw, Poland

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Abstract

Objective: To identify determinants of fruit and vegetable (F&V) consumption among school-aged children.

Design: A survey study was conducted in October 2010. The questionnaire contained questions concerning social and demographic data, lifestyle and dietary habits, particularly the frequency of F&V consumption, availability of F&V and knowledge about recommended amounts of F&V intake.

Setting: Polish primary schools.

Subjects: Children (n 1255) aged 9 years from randomly selected primary schools and their parents.

Results: The children's consumption of fruit and of vegetables was influenced by the fruit consumption and vegetable consumption of their parents ($r=0{\cdot}333$ and $r=0{\cdot}273$, respectively; $P=0{\cdot}001$), parents encouraging their children to eat F&V ($r=0{\cdot}259$ and $r=0{\cdot}271$, respectively; $P=0{\cdot}001$), giving children F&V to take to school ($r=0{\cdot}338$ and $r=0{\cdot}321$, respectively; $P=0{\cdot}001$) and the availability of F&V at home ($r=0{\cdot}200$ and $r=0{\cdot}296$, respectively; $P=0{\cdot}001$). Parental education influenced only the frequency of fruit consumption ($r=0{\cdot}074$; $P=0{\cdot}01$). A correlation between parents' knowledge of the recommended intakes and the frequency of vegetable and fruit consumption by children was noticed ($r=0{\cdot}258$ and $r=0{\cdot}192$, respectively, $P=0{\cdot}001$).

Conclusions: Factors within the family environment such as parents' dietary habits and F&V availability had the greatest influence on the F&V consumption by children. Educational activities aimed at parents are crucial to increase the consumption of F&V among children.

Keywords
Vegetable consumption
Fruit consumption
Children nutrition
Determinants of consumption

Childhood is a crucial period within the process of shaping correct dietary habits, including the consumption of fruit and vegetables (F&V)[1]. Studies show that the dietary habits and preferences shaped during childhood and adolescence are continued into adult life[1,2] and that a diet rich in vegetables and fruit lowers the risk of many chronic diseases[3]. There are many factors which may influence the consumption of F&V by children. Apart from preferences, these factors include age, sex, domicile, social and economic factors, parents' education, parents' dietary habits concerning the consumption of F&V and the availability of F&V at home[4–7]. Studies show that the consumption of F&V by children from different populations, including Polish children, is unsatisfactory, deviating from the recommendations on the amounts and well as the frequency of consumption[4,8–11].

F&V constitute a very important element of healthy nutrition. In a child's diet there should be approximately five portions of F&V each day. These foods are a vital source of antioxidants, fibre, vitamins and minerals. That is why they are a necessary element of a daily diet[3]. The majority of benefits from eating F&V result from the lowering of the risk of CVD, but F&V may also lower the risk of certain kinds of cancer. Research from the European Prospective Investigation into Cancer and Nutrition (EPIC)–Potsdam study has shown that a high vegetable intake lowers the risk of cancer, heart attack and CVD[12]. A large quantity of vegetables in the diet helps to lower energy intake and is directly correlated to a lower BMI. The WHO estimates that insufficient intake of F&V is the cause of about 14 % of gastrointestinal cancer deaths, about 11 % of IHD and about 9 % of stroke

*Corresponding author: Email kwolnick@izz.waw.pl

deaths globally[13]. The WHO recommends a minimum intake of 400 g of F&V daily, excluding potatoes and other starchy tubers such as manioc[14].

In Poland, F&V intake by children is insufficient. Research conducted by Wolnicka and Jaczewska-Schuetz on a group of Warsaw primary-school students showed that 35·8 % of the children did not eat F&V every day[10]. An international survey, the Health Behaviour in School-aged Children (HBSC) study (a WHO collaborative study), revealed that only 38·9 % of children aged 11–12 years eat fruit every day, and only 23·8 % in the group of teenagers aged 15–16 years. Only 30·7 % of 11–12-year-old children and 26·2 % of 15–16-year-old teenagers eat vegetables every day[15].

Like all nutrition habits, the consumption of F&V is influenced by many factors, often occurring simultaneously. These are factors related to the physical, social and cultural environment, as well as personal factors, such as taste preferences, independence level and knowledge. A meta-analysis evaluating ninety-eight studies on determinants influencing F&V intake in children and adolescents aged 6–18 years (the first research dated 1958, the most recent being 2005) found that the most broadly described factors, supported with a large body of evidence, are age, sex, social and economic status, preferences, F&V intake by parents and availability of F&V at home[7].

Nutrition habits and preferences form, to a large extent, in childhood and that is why many initiatives aimed at increasing F&V consumption are addressed to children. Projects oriented to increase F&V consumption are most often conducted in schools. In the EU the 'School Fruit Scheme', commenced as an initiative to reverse negative trends of children's nutrition habits, and especially insufficient F&V intake, is one such project.

The 'School Fruit Scheme' is a programme of the Common Agricultural Policy and was created as one of the priority activities of the European Commission aiming to improve the health and nutrition habits of children, and to reduce the risk of serious health problems at a later stage of life. The scheme started in the 2009/2010 school year and covers the majority of EU member states, including Poland. So far, the scheme has been financed from the EU budget (75 %) and member states' budgets (25 %). The scheme aims at the development among children of a permanent habit of eating F&V, by providing children with F&V and via special educational activities promoting healthy diet and lifestyle. In Poland children receive free F&V portions, to be eaten at school, two to three times weekly.

The implementation of such schemes at schools allows the combination of various types of activities. Activities aimed at the development of abilities, such as running school gardens, cooking courses, organizing special vegetable days and proper nutrition of children at schools, are more effective than traditional teaching methods during classes[16].

F&V distribution, as well as engaging parents, teachers and peers in the programme, improves the results of interventions undertaken at schools, too. The engagement of parents seems to be of major importance, as parents' intake, parents' encouragement of children and availability of F&V at home are determinants which strongly influence the consumption of F&V by children[17]. If we want the education programme regarding the improvement of nutrition and physical activity to bring expected and permanent results in terms of changing children's nutrition habits into health-conscious nutrition habits, the whole school environment and parents must be involved actively in the work. A review of school programmes aimed to increase F&V intake in school-aged children found that over 75 % of these programmes were using multi-component activities[18]. It was hard to evaluate which of these activities were the most effective. That is why the authors of the meta-analysis underlined the fact that the improvement of F&V intake in children may be achieved via a number of activities undertaken simultaneously.

The objective of the present analysis was to identify the determinants of consuming F&V among school-age children in Poland.

Materials and methods

The research was conducted in 2010 within the programme 'Fruit in Schools' in five chosen voivodeships (Pomorskie Voivodeship, Opole Voivodeship, Wielkopolskie Voivodeship, Podkarpackie Voivodeship and Masovian Voivodeship) representing north, south, west, east and central regions of the country. The study covered 1255 pupils aged 9 years from thirty-eight randomly selected primary schools and their parents. A stratified sampling was performed with school as the basic unit of sampling. A list of schools participating in the 'Fruit in Schools' programme of 2010/2011 (covering 71 % of all primary schools in Poland) created by Agricultural Market Agency served as a basis for establishing the sampling frame. Before sampling, schools were stratified into two areas: rural and urban. In each researched voivodeship, four schools from urban areas and three schools from rural areas were selected. In the second stage, sampling without replacement was performed, selecting two third grade classes from each school. In the event where there were not two groups, another school was added. The study was designed in such a manner that a given group of pupils reflected the structure of the pupils' community learning in schools from urban and rural areas in Poland. The sex structure was representative of the country. In total, 1595 pupils at the age of 9 years were invited to participate in the study. Data from children who were present at school at the day of the study, who correctly filled out the survey and whose parents consented to the study were analysed. The analysed group of 1255 pupils (627 girls and 628 boys) accounts for 78·7 % of the group invited to participate in the study.

In the case of both parents and their children, the evaluation was undertaken by means of a questionnaire. The questionnaire for children contained closed-ended questions about their lifestyle and dietary habits, including in particular the frequency of F&V consumption and F&V availability (see online supplementary material for the questions and answer categories). The questionnaire is based on the Pro Children Study questionnaires and was validated previously[19]. The specific determinants were chosen based on outcomes from qualitative studies (interviews and focus groups comprised of school-aged children) and other self-administered food questionnaires completed in classrooms[19]. The questionnaire for parents contained questions pertaining to demographic data (income, education) as well as questions testing their knowledge of the recommended amounts of F&V intake. Parental income was set based on parents' report of monthly household income per person on an eight-category scale starting with PLN 250, then PLN 500 and then every PLN 500 to the answer 'above PLN 3000' (PLN = Polish zloty; Table 1). Self-reported data on parental educational level (classified as primary, secondary, vocational or higher) are presented in Table 2. Parental dietary knowledge was measured by the item 'How many portions of fruit and vegetables should a healthy diet include for your children?' using a scale ranging from 1 to 8, where 1 = 'should not eat fruit and vegetables at all' to 8 = 'five or more portions per day' as correct knowledge (online supplementary material).

The pupils filled out the questionnaire on their own, during a 45 min class, following the instructions given by the survey conductor present in the class, and parents filled out the questionnaire at home. The average frequency of vegetable consumption was calculated as the sum of the consumption frequency of vegetables in salads, other vegetables such as cut and cooked vegetables. The frequency of fruit consumption was calculated as the consumption of fresh fruit. The consumption of juice and potatoes, about which the respondents were also asked (see online supplementary material), was omitted. Juice is sometimes excluded from recommendations referring to F&V intake (e.g. in Belgium and Spain), it is sometimes included with some limitations such as being counted as a maximum of one portion (e.g. in Denmark, Netherlands and Sweden) and fully included in other countries (e.g. in Iceland and Norway)[20]. Although in Poland one of the five daily F&V portions can be juice, we decided to analyse F&V without juice due to the low consumption of F&V by children, which is not observed in the case of juice.

The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Ethics Committee of the National Food and Nutrition Institute. Written informed consent was obtained from all participants.

In order to determine the correlation between the examined variables, a correlation analysis was conducted. The Pearson correlation coefficient (r) was calculated for the entire sample.

Table 1 Monthly parental income (PLN per person in family) reported by study participants: parents of children aged 9 years from randomly selected primary schools, Poland, 2010

Parental income	%
Up to 250	13·2
Up to 500	30·7
Up to 1000	29·3
Up to 1500	13·7
Up to 2000	6·2
Up to 2500	2·7
Up to 3000	1·2
Above 3000	3·0

PLN, Polish zloty.

Table 2 Parental education reported by study participants: parents of children aged 9 years from randomly selected primary schools, Poland, 2010

Parental education	%
Primary	5·5
Secondary	39·8
Vocational	22·9
Higher	31·8

Results

Analysis of the obtained data showed that parental income did not have any influence on children's frequency of fruit consumption or vegetable consumption. Parental education exerted an influence only on children's frequency of fruit consumption. A statistically significant positive correlation was noticed between parental knowledge of the recommended amounts of F&V intake and children's frequency of fruit consumption and vegetable consumption: the greater the parent's awareness, the greater the mean consumption of vegetables and fruit by a child. The results are shown in Table 3.

The frequency of children's fresh fruit consumption showed a weak statistically significant positive correlation with the frequency of parental fruit consumption as evaluated by children, with the frequency of parents encouraging their children to eat fruit, with the frequency of having access to fruit, with the frequency of children eating sliced fruit served to them between meals, as well as with the frequency of children receiving fruit to be taken to school (Table 4).

The frequency of children's vegetable consumption showed a weak statistically significant positive correlation with the frequency of parental vegetable consumption as evaluated by children, with the frequency of parents

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Table 3 Correlations between consumption frequency of fresh fruit and vegetables by children and parental education, income and knowledge; children (*n* 1255) aged 9 years from randomly selected primary schools and their parents, Poland, 2010

	Child	
	Mean frequency of fresh fruit consumption (*r*)	Mean frequency of vegetable consumption (*r*)
Parental education	0·074**	0·017
Parental income	0·024	−0·031
Parental knowledge	0·192***	0·258***

Significance of the correlation: **at 0·01 level, ***at 0·001 level.

Table 4 Correlations between consumption frequency of fresh fruit and vegetables by children and parental dietary habits and availability; children (*n* 1255) aged 9 years from randomly selected primary schools and their parents, Poland, 2010

	Child	
	Mean frequency of fresh fruit consumption (*r*)	Mean frequency of vegetable consumption (*r*)
Parental frequency of eating fruit/vegetables	0·333***	0·273***
Parental frequency of encouraging to eat fruit/vegetables	0·259***	0·271***
Frequency of having access to fruit/vegetables	0·200***	0·296***
Frequency of eating sliced fruit between meals	0·294***	–
Frequency of receiving fruit/vegetable to be taken to school	0·338***	0·321***

Significance of the correlation: ***at 0·001 level.

Table 5 Correlations between consumption frequency of fresh fruit and vegetables by children and other dietary habits; children (*n* 1255) aged 9 years from randomly selected primary schools, Poland, 2010

	Child	
	Mean frequency of fresh fruit consumption (*r*)	Mean frequency of vegetable consumption (*r*)
Frequency of eating breakfast before leaving home	0·120***	0·066*
Frequency of eating fast foods	−0·007	−0·050
Frequency of drinking soft drinks	0·017	−0·068*
Frequency of eating salty snacks	0·021	−0·073**
Frequency of physical activity after school	0·153***	0·174***

Significance of the correlation: *at 0·05 level, **at 0·01 level, ***at 0·001 level.

encouraging their children to eat vegetables, with the frequency of having access to vegetables and with the frequency of children receiving vegetables to be taken to school (Table 4).

The frequency of children's fresh fruit consumption showed a weak statistically significant positive correlation with the frequency of breakfast consumption before leaving for school and with the frequency of engaging in physical activities after school (Table 5).

The frequency of children's vegetable consumption showed a weak statistically significant positive correlation with the frequency of breakfast consumption before leaving for school, a weak negative correlation with the frequency of soft drink consumption and with the frequency of salty and sweet snack consumption. The frequency of children's vegetable consumption showed a weak statistically significant positive correlation with the frequency of engaging in physical activity after school. The results are shown in Table 5.

Discussion

There are many factors that may influence the consumption of F&V by children, young people and adults. The review of the literature pertaining to the determinants of F&V consumption by children and young people conducted by Rasmussen *et al.*[7] showed that the main factors of influence, best described and supported by numerous proofs, are age, sex, social and economic status of a family, preferences, consumption of F&V fruit by parents and the availability of F&V at home. Many of the works reviewed indicated that, among children and teenagers, the consumption of vegetables and fruit decreases with age.

A number of previous studies have shown that the income of a family is a determinant of F&V consumption by children. On the basis of the study of Dibsdall *et al.*[21] which included 680 women and men aged 17–100 years with a low income, it was concluded that groups with a

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low income consume smaller amounts of F&V than groups with a higher income. Only 18 % of the respondents with a low income reported that they ate five or more portions of F&V daily. Unemployed persons (49 %) reported to consume F&V rarely (0–2 portions/d) most often. The report of the WHO evaluating the effectiveness of programmes and interventions promoting the consumption of F&V emphasized that high prices of such products negatively influence their level of consumption[13]. However, one Polish study[22] demonstrated that there was a statistically significant decrease in the frequency of healthy product consumption (vegetables, fruits) between 2002 and 2006 despite an increase in the wealth of families. Such an observation suggests that increased wealth of the families did not translate into health-oriented choices. Our study showed that family income did not have any connection with the frequency of consuming vegetables and fruit by children. Both in urban and rural environments, the origin of vegetables and fruit could have been a factor influencing the result. Many Polish households obtain such products from home gardens (particularly rural households), which is connected with lower costs. The issue, however, still needs to be analysed in detail, particularly the aspect of social and economic differences among different countries.

The education of parents seems to be another factor influencing children's F&V consumption. The results of the present study suggest that it exerts influence on the consumption of fruit but not vegetables. A study of kindergarten children in London[4] proved that children of parents with a higher education level ate more vegetables. However, in that study this correlation was not observed with regard to fruit. The influence of mother's education was analysed in eight papers of which four found a positive correlation between a higher or more frequent intake of fruit and/or vegetables and a higher educational level of the mother; three of them did not demonstrate such a relationship and one study conducted in China showed a reverse correlation[7]. Higher education is often connected with paying more attention to healthy dietary habits, which should be reflected in the consumption of both vegetables and fruit. It is also very probable that certain values and social effects related to level of education exert an influence on behaviours connected to eating, including the consumption of vegetables and fruit[23]. Perhaps in the present study there were many factors affecting the connection between parents' education and children's consumption of F&V. Vegetables are ingredients of many dishes in the Polish traditional cuisine such as soups; they constitute additions to sauces and meat; and education perhaps has not influenced their consumption. It is easier and simpler to increase F&V consumption by giving children fruit[24,25]. Fruit, by principle, is more liked by children than vegetables[25,26] – there is a greater probability that a child will eat it; and an educated, theoretically aware parent may more willingly give fruits to children, taking into consideration the aspects of healthy diet. This subject, however, needs to be analysed more thoroughly.

Availability is another factor influencing the consumption of F&V. The issue of availability is analysed within such aspects as, for example, having sliced vegetables in the fridge prepared for direct consumption and putting fruit platters on the table or children's desks. American studies pointed out that children who had easy access to F&V consumed more of such products than children from houses where the availability was small[27–29]. The role of the parent is particularly significant since parents directly shape the physical and social environment of children from the very early years and directly influence their behaviour, habits and attitudes[30]. Their own habits, as well as customs which they introduce into the household such as eating together or consuming F&V, shape the patterns of food consumption of children[30–33]. As persons responsible for the availability and diversity of food at home, parents also influence what kind of foods children are eating. The WHO reports that a lack or a limited supply of F&V, such as poor diversity of the offers in snack bars, canteens and local shops, as well as a low quality of products, are obstacles to increasing the consumption of this group of products[13]. In the present study, a positive correlation between the frequency of F&V consumption by children and the availability of such products at home was observed.

Many authors underline that the amount and frequency of F&V consumption by children and young people are influenced also by family factors and habits. Patterns of family meals, especially meals eaten together, positively affect the consumption of F&V[4,7,9,30]. Children like to consume products they know – the more often children eat a given product, the more they like it. Children familiarize themselves with new tastes and products through experience as well as by observing dietary behaviours of other people present in their environment (parents, siblings, peers)[4,31,34,35]. The present study confirmed the role of the influence exerted by the family environment and health-oriented attitudes of parents (parents eating F&V, encouraging children to eat F&V, giving sliced F&V between meals, giving children F&V to take to school) on the F&V consumption of their children. Similar observations were obtained in the study of Pearson *et al.*[30] which demonstrated that good examples shown by parents and parents encouraging children to eat F&V are better ways to increase the consumption of this group of products than putting pressure on children to eat F&V. The study of kindergarten children in London[4] showed that the consumption of F&V by parents positively influenced the increase in consumption of this group of products by children. It was reported that an early introduction of F&V into the diet of a child (getting him/her used to these products) resulted in a higher consumption in later years. Eating meals together with the family also increased the consumption of vegetables (not fruit) by children.

Parents' knowledge of the principles of a healthy diet and its influence on human health is yet another determinant of children's F&V consumption. A study by Baker and Wardle[36] confirmed that knowledge of the recommendations concerning the consumption of F&V had a significant influence on the consumption of these products. Daily consumption of vegetables and fruit was about 1·5 times greater among people who realized that a correlation exists between F&V consumption and the prevention of diseases than among people who did not have such knowledge. The results of our study also suggest that parental knowledge pertaining to the recommended F&V intake amounts exerted an influence on the frequency of the consumption of F&V, particularly vegetables, by children. This can be associated with the fact that a parent with knowledge of the recommended amounts of vegetable and fruit intake is simultaneously aware that vegetables should be consumed more often than fruit, which is underlined not only in scientific publications but also in generally available media (press, Internet, television). Shaikh *et al.*[37] claim that knowledge of a healthy diet is among the strongest psychosocial factors influencing the level of consumption of F&V.

The consumption of F&V is one of the elements of a family's healthy lifestyle. In families leading a healthier lifestyle, eating F&V more often seems natural. The consumption of F&V by children is connected with the level of their consumption in families and probably with other healthy habits[4]. Our study confirmed that observation: higher F&V consumption by children was connected with their positive dietary habits and frequency of physical activity.

The results of the present research point to a significant role of the family environment and appropriate attitudes of parents in shaping the health-oriented behaviours of their children, including the consumption of F&V. Because the consumption of those products differs from the recommendations, the consumption of fruit and of vegetables (particularly vegetables) should be promoted not only among children but also among parents as people responsible for the consumption and availability of F&V at home. In order to strengthen the healthy habits which originate at home or to correct them if there is such a need, the dietary education should be continued at schools. Taking into consideration the results of the evaluation of educational programmes promoting F&V consumption among children, it seems that such activities are more effective in younger groups; hence they should be conducted among the youngest children (kindergartens, primary schools) at a larger scale[16].

The present study is limited in that the study population included children only from third grade of primary school. Future studies should also include older and younger pupils or from various grade levels to examine the influence of age. All data were self-reported and thereby may be limited by children's comprehension and memory.

Conclusions

Among a population of Polish schoolchildren aged 9 years, greater consumption of F&V was prompted by family factors (the consumption of F&V by parents, encouraging children to eat F&V, giving children F&V to take to school, the availability of F&V at home). The frequency of F&V consumption was also influenced by parents' knowledge of the recommended amounts of F&V intake. Education level of the parents significantly affected only the consumption of fruit. Family income did not have any impact on the frequency of fruit or vegetable consumption by children. Higher consumption of F&V by children correlated with their positive dietary habits and frequency of physical activity. Results point to a crucial significance of educational activities aimed at parents and the need to conduct them in order to increase the consumption of F&V among children.

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Supplementary material

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