

ASSESSMENT OF NUTRITIONAL STATUS OF SELECTED GROUP OF CHILDREN LIVING IN URBAN AND RURAL AREAS IN UPPER SILESIA, IN THE INTERVENING FIVE YEARS

JOLANTA WITANOWSKA¹, ANNA OBUCHOWICZ², ANETA WARMUZ-WANCISIEWICZ^{1,3},
and URSZULA SZCZUREK¹

¹ Medical University of Silesia, Katowice, Poland

Pediatric Nursing Department in Bytom

² Medical University of Silesia, Katowice, Poland

Chair and Department of Pediatrics in Bytom

³ Higher School of Strategic Planning, Dąbrowa Górnicza, Poland

Department of Nursing and Midwifery

Abstract

Objective: The aim of the paper is to assess changes in nutritional status of a selected group of children from urban and rural environment in Upper Silesia in the intervening 5 years. **Materials and Methods:** The study was conducted twice — in 2003 and during the school year 2008/2009, and involved children from the town of Bytom and from the village Boronów. To assess the nutritional status, the following measurements were used — weight, height and thickness of subcutaneous fold. Body Mass Index (BMI) was also calculated. The results obtained were referred to the appropriate percentile charts. Measurement values, which were located below the 10th percentile or above the 90th percentile were treated as incorrect. Statistical analysis included only those children who participated in the I and II survey. The frequency of the anthropometric measurements and BMI exceeding the accepted limits of norms in both studied environments and between them, 5 years after the previous evaluation, were compared. **Results:** In both environments, the number of pupils whose body mass exceeded the value of the 90th percentile increased. The number of pupils whose body mass was lower than the 10th percentile also increased in the city, but decreased in the country. Considering BMI, the percentage of children located above the norm increased as well in comparison to the first study. In addition, it was also found that the thickness of subcutaneous skin-fold difference between the studied communities was significant in both the first ($p = 0.020$) and the second survey ($p = 0.015$), as well as in each environment, after 5 years since the previous evaluation (Bytom: $p = 0.001$; Boronów: $p = 0.32$). **Conclusion:** In 5 years (2003–2008), the incidence of overweight of pupils increased in both groups. The percentage of pupils who weighed less than 10th percentile increased to a greater extent in urban environment than in rural areas.

Key words:

Children, Nutritional status, Life environment

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Address reprint request to A. Warmuz-Wancisiewicz, ul. Legionów Polskich 125/71, 41-310 Dąbrowa Górnicza, Poland (e-mail: anetawarmuz@wp.pl).

INTRODUCTION

In different environments, changes in nutritional status of children and adolescents are currently assessed, paying particular attention to the increasing prevalence of obesity as a disease of civilization. In Poland, there are regions in which deep transformation of the social structure has been occurring for the last decade. One of them is Upper Silesia. There are areas which are environmentally different on its territory: large industrial belts with environmental degradation, as well as rural ones, with more favorable environmental conditions. People live there in different economic and social conditions [1]. Economic changes associated with the introduction of the market economy in recent years resulted in considerable diversity of living conditions of our society, both in the city and the countryside. They can cause an impairment of nutritional status — overweight and obesity or weight deficiency — both in adults and in children and adolescents [2]. Most studies evaluating this problem are based on single measurements of nutritional status indicators. A more complete picture of changes in nutritional status of the inhabitants of certain environments can be obtained repeating the nutritional assessment of the same individuals at an interval of time.

The aim of the paper is to assess changes in nutritional status of a selected group of children from urban and rural environment in Upper Silesia in the intervening 5 years.

MATERIALS AND METHODS

The study was conducted twice — in 2003 and during the school year 2008/2009. It involved children from the chosen region of Silesia such as the town of Bytom (I survey: 103 children including 57 girls and 46 boys; II survey embraced 56 pupils from the previous group — 29 girls and 27 boys) and from the village Boronów (I survey: 68 pupils including 34 girls and 34 boys, II survey: 47 pupils from the previous group — 22 girls and 25 boys).

The primary school in Bytom, where pupils were examined, was selected from seven schools located in the center and teaching at primary level. The reason for such selection was the downtown location of the school, in the district related to currently the only active coal mine in that area, namely “Bobrek–Center”. In the neighborhood, there is a primary school offering integrated teaching, but children attending it could not have been included in the study group due to their disabilities. The research in Boronów included pupils from the only elementary school there. The study comprised all pupils attending these schools, whose parents gave their consent for examination. During the first study the children were aged 7–9 years. The results of the measurements and comparative analysis of both communities during I survey have been published [3]. The investigation was approved by the Bioethical Commission of the Silesian Medical University, as well as the headmasters of the listed schools and the parents of examined pupils.

The reduction in the size of the research group during the second survey resulted mostly from a change in the children’s residence place (often related to parents’ changing their place of employment), or less often due to the lack of parental willingness to repeat anthropometric measurements.

To assess the nutritional status, the following measurements were used — weight, height and thickness of subcutaneous fold. Body Mass Index (BMI) was also calculated. The results obtained were referred to the appropriate percentile charts [4,5]. Measurement values, which were located below the 10th percentile or above the 90th percentile were treated as incorrect. Statistical analysis included only those children who participated in I and II survey. The prevalence of anthropometric measurements and BMI above or below the adopted norms in I and II survey in both environments were compared. The individual percentile position of listed measurements and BMI of each pupil were also compared at an interval of 5 years.

In order to compare the average values of measurable parameters in both environments, Student's t-test and chi-2 independence were used. In this study, the level of significance $p < 0.05$ was adopted as statistically significant.

RESULTS

An important indicator of child's development is the height of the body — during I and II survey it was normal in most children. The percentage of children whose body height was shorter than the accepted norm increased in the period between I and II test in Boronów (from 8.5% to 12.8%) and in Bytom (from 12.5% to 14.3%). In Boronów, there also increased the percentage of children whose body height exceeded the 90th percentile (from 6.4% to 10.5%) (Figure 1). Comparative analysis revealed that the differences between the examined environments in both studies are not significant.

As for the percentile position of the body weight, the highest percentage of the children from both communities was located within 10–90th c during the first and the second survey. However, in the period between I and II testing in both environments, the percentage of children with the body mass located within the normal range decreased. During this period, in both environments, there increased the number of school children whose body weight

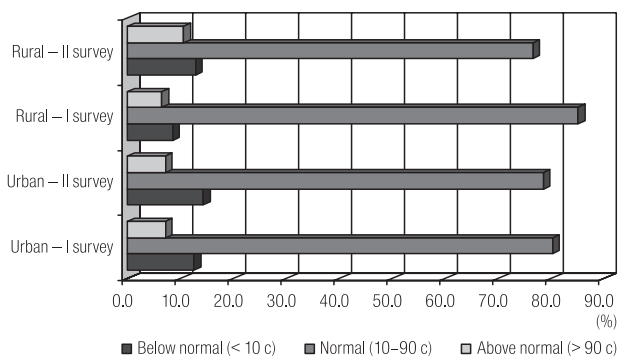


Fig. 1. Percentage distribution of body height percentiles in relation to the standards concerning the children in urban and rural environments with an interval of 5 years.

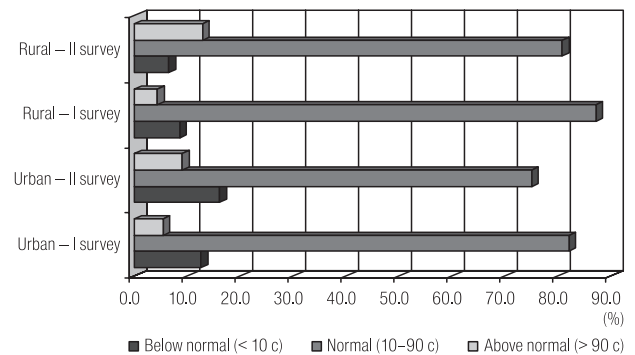


Fig. 2. Percentage distribution of percentile values concerning the body weight of studied children in relation to the standards in urban and rural environments with an interval of 5 years.

exceeded the 90th percentile — in urban areas from 5.4% to 8.9%, and in rural areas from 4.3% to 12.8% of the pupils. These differences were not statistically significant ($p > 0.05$). Comparison of the percentage of pupils whose weight was lower than the 10th percentile showed that within 5 years it increased in urban areas (from 12.5% to 16.1%) and decreased in the countryside (from 8.5% to 6.4%). These differences in the frequency in each environment and between environments are not statistically significant ($p > 0.05$) in both I and II study (Figure 2).

In the studied groups, with an interval of 5 years, the percentage of children whose BMI was normal decreased. In I and II survey, it was respectively — in Bytom, 76.7% and 75% (difference: 1.7%), and in Boronów 87.2% and 82.3% (difference: 4.9%). However, the number of pupils with BMI above the 90th percentile increased — in the urban environment from 5.4% to 10.7% ($p = 0.01$), and in rural areas from 8.5% to 12.8% ($p > 0.05$) of the pupils. Comparison of the percentage of children with BMI below the 10th percentile showed that within 5 years it decreased in the urban area (from 17.9% to 14.3%) ($p > 0.05$), and it remained at the same level in the country (4.3%) (Figure 3). In terms of BMI, the difference between the studied communities was statistically significant only at the time of I study, in favor of the rural areas ($p = 0.03$).

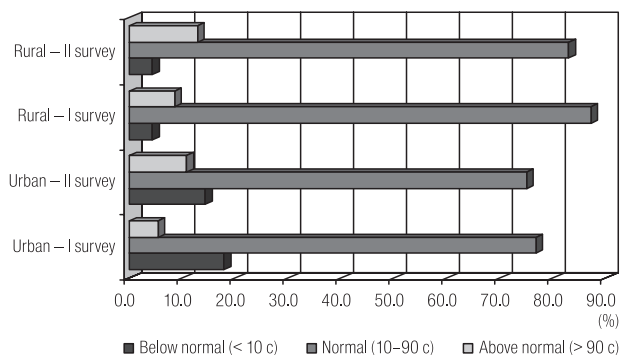


Fig. 3. Percentage distribution of BMI percentile values of tested the children in relation to the standards in urban and rural environments with an interval of 5 years.

The percentage of children whose thickness of subscapular skin-fold was located above the 90th percentile was insignificantly higher during II survey in both environments. In Bytom, it increased by 1.8% (from 10.7% to 12.5%), and in rural areas by 4.3% (from 17% to 21.3%). At the same time, in the urban environment, 10.7% of children were found to have subscapular skin-fold thickness situated below the 10th percentile (there were no such results in I survey; $p = 0.011$), whereas in rural areas this percentage decreased from 2.1% to zero ($p > 0.05$) (Figure 4). It was discovered that in terms of the assessed characteristics, the difference between the studied communities was significant in both I ($p = 0.020$) and II study ($p = 0.015$),

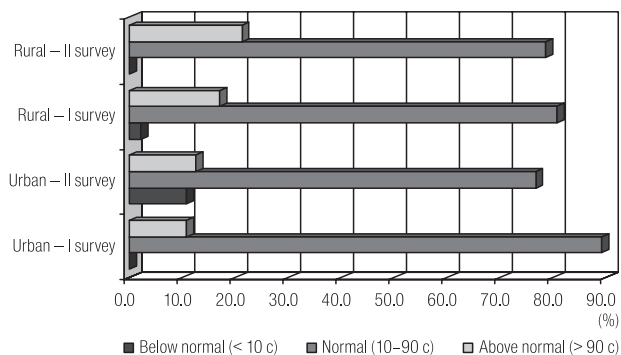


Fig. 4. Percentage distribution of percentile values of subscapular skin-fold thickness in the surveyed pupils in relation to the standards in urban and rural environments with an interval of 5 years.

and also in both environments after 5 years since the previous evaluation (Bytom: $p = 0.001$; Boronów: $p = 0.32$). Analysis of individual changes in the body weight percentile position of pupils included in the research at an interval of 5 years showed that only in the urban environment the body weight of 7.1% of the children decreased to the values below the 10th percentile. In 5.4% of the urban children the body weight increased to the values above the 90th percentile, and in rural areas the percentage of these children equaled 8.5%. Only in Bytom, excessive body weight (> 90 c) in 1.8% of the children decreased over the 5-year interval to reach the normal range. In both environments, a small percentage of the children with the body mass located below the 10th percentile, was found

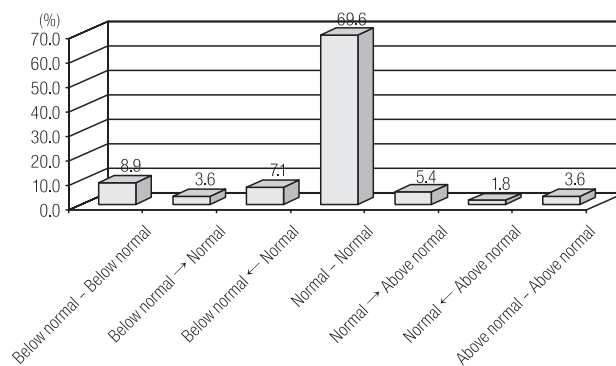


Fig. 5. Analysis of individual changes in the body weight percentile position of the examined pupils in the urban environment with an interval of 5 years.

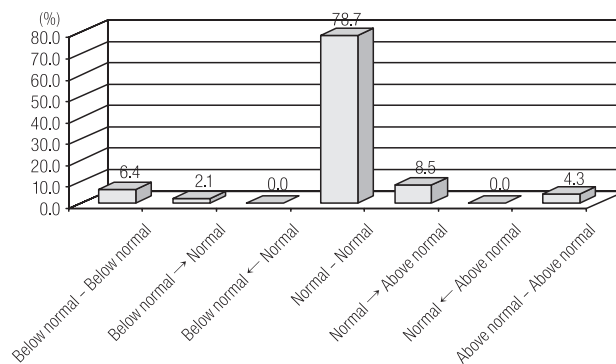


Fig. 6. Analysis of individual changes in the body weight percentile position of pupils surveyed in the rural environment with an interval of 5 years.

after 5 years to be placed within the normal range (in Bytom — 3.6%, in Boronów — 2.1%) (Figures 5 and 6). Analysis of individual changes in the percentile position of the examined pupils' body mass according to the standards showed a statistically significant correlation between the studied communities ($p = 0.042$).

In respect of BMI, the highest percentage of children in both environments stayed within the norm (66.1% in the city; 78.7% in the rural areas) during II study compared to I survey (Figures 7 and 8). The percentage of children whose BMI, after 5 years since the first evaluation, increased from the normal level to the values above the 90th percentile, equaled 5.4% in the city and 6.4% in the rural areas, and the percentage which decreased

and reached the level below the 10th percentile was 5.4% of the children in the city and 2.1% in the rural areas. The percentage of children whose BMI was located below the 10th percentile, and after 5 years it increased to the values within the normal range was in Bytom 8.9% and in Boronów — 2.1% (Figures 7 and 8). Analysis of individual changes in the BMI percentile position of examined pupils with respect to the accepted norm showed that the difference between the studied communities is not significant.

DISCUSSION

Over the past 30 years most countries have witnessed a marked increase in the prevalence of overweight and obesity in both children and adults. Currently, obesity affects nearly 22% of children and adolescents in the U.S., in Europe about 6–15%, and in Poland — 2.5–12%, depending on the region and/or years in which the research was carried out [6,7].

A study published by Oblacińska in 1997 showed that obesity and overweight are more common in pupils in the city than in rural areas [6]. In the study presented hereby, conducted in 2003, the body weight above the 90th percentile was found insignificantly more commonly among the pupils in Bytom, while after 5 years — it was observed more often, although insignificantly, in Boronów. In recent years, deepening of the disparities in the socio-economic status has been observed between such urban areas as Bytom and a rich village such as Boronów. This is connected with the unemployment caused by the reorganization of the mining industry and diminishing of the household income values. This situation probably influences the nutritional status of residents in both areas, including children. Wolnicka et al. drew attention to the current environmental differentiation of the nutritional status on the example of young people in the district city (Radom), and Warsaw, to the detriment of the former [8]. In our study,

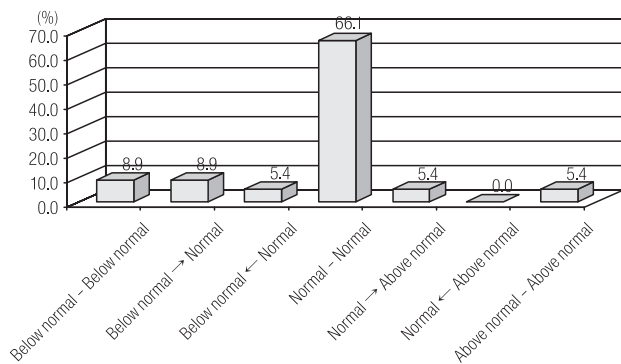


Fig. 7. Analysis of individual changes in the BMI percentile position of the tested pupils in the urban environment with an interval of 5 years.

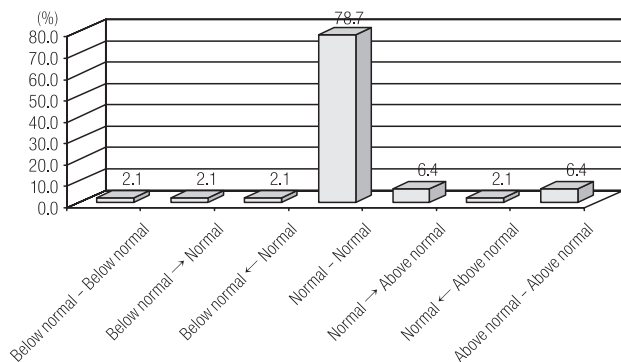


Fig. 8. Analysis of individual changes in the BMI percentile position of the tested pupils in the rural areas with an interval of 5 years.

the incidence of overweight determined according to BMI increased in both examined environments. The comparison of the percentage of children whose BMI exceeded the 90th percentile value in I and II survey confirms more frequent occurrence of obesity in the rural environment. According to both surveys, it equaled 5.4% and 10.7% in the urban areas, and 8.5% and 12.8% in the rural areas. Such environmental diversity of nutritional status of examined children is also confirmed by the results of the measurements of subscapular skin-fold thickness.

The problem of excess body weight evaluated with the use of BMI was also dealt with by Olszanecka-Glinianowicz et al. [9], who studied a randomly selected population of children in Silesia and noted that excess body weight occurred in the Silesia region in 11.6% of children aged 7–9 years. An Italian group of researchers examining the 8-year-old children in the province of Pistoia, found a significantly higher percentage of children whose BMI exceeded the 85th percentile in the rural areas than in urban ones (24% vs. 18%) [9]. Also, a Czech study showed that the number of overweight children was higher in smaller communities (6.9% vs. 2.3%), and the number of slim children was higher in large cities (12.1% vs. 8.6%) [11]. The presented research indicates that, in addition to overweight, the problem of malnutrition among pupils is varied in the evaluated environments. The incidence of deficiency of the body weight among the children living in Bytom increased in the intervening 5 years, whereas in Boronów the opposite tendency was observed. Furthermore, in the urban environment the incidence of weight deficiency among pupils in both I and II survey was about two times higher than in the rural areas.

A higher percentage of children with BMI located below the 10th percentile than above the 90th percentile was also found among school children in Zabrze in the school year 2003/2004 [12]. A higher percentage of prepubertal pupils diagnosed with malnutrition, but not overweight and obesity, was also discovered by Janus et al. [13].

Pyrzak et al. [14], who studied a population of children aged 7–9 years in Mazowieckie found that 78.6% of school children were properly fed; 5.4% of the study group were underweight, 8.87% were overweight and — 3.33% were obese. The problem of underweight was also indicated by Ołtarzewski and Szponar [15], who conducted examinations of children and adolescents (aged from 1 to 18 years) from randomly selected families from all over the country. Many environmental factors that require separate analysis may have influenced our results. Nevertheless, they confirm the maintaining diversity of living conditions in rural and urban areas in Upper Silesia.

Furthermore, the increase in the frequency of measurements of subscapular skin-fold thickness falling below the 10th percentile shows the deterioration in the nutritional status of the studied group of children from Bytom after 5 years, which was not found in Boronów. It should also be noted, that the differentiation of the percentile position concerning individual centile items in respect of the subscapular skin-fold thickness of the studied children from Bytom and Boronów in the second trial was significantly dependent on the environment to the detriment of the city.

In addition to the comparison of the changes in the nutritional status occurring in both groups included in the research, another aspect worth noting is the analysis of changes in the nutritional status of individual pupils. In the urban environment, repositioning of the percentile of the body weight and BMI towards the normal level was observed, while in the rural areas the values tended to reach above the 90th percentile.

Results of this study confirm not only an insignificant increase in the percentage of children with excessive body weight (higher in rural areas), but at the same time the increase in the number of undernourished school children (higher in the urban environment in Bytom). The results of the hereby presented study are in fact worrisome from the standpoint of public health and medicine

of developmental age and require further research. Because of the small size of the study group it is difficult to draw firm conclusions about the advantages of changes in the nutritional status of children living in urban and rural areas in Upper Silesia, in the direction of malnutrition or towards overweight and obesity. Therefore, it is necessary to continue the research in these domain.

CONCLUSION

In 5 years (2003–2008), the incidence of overweight among the selected groups of pupils increased in the city (Bytom) as well as in the country (Boronów) in Upper Silesia. The percentage of pupils whose weight was below the 10th percentile increased to a greater extent in the urban environment than in the rural areas.

The example of Bytom and Boronów indicates that children living in the urban environment in Upper Silesia are at higher risk of the occurrence of insufficient body weight than children living in the rural environment.

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