

Double burden of nutrition disorders among schoolchildren, necessity for appropriate public health policies and interventions

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Abstract: Growth disorder is one of non-specific but important indicator of ill-health particularly among children. The most reliable and frequently used method to measure normal weight is Body Mass Index (BMI). Double burden of nutritional disorders may exist in low and middle income countries. This was a cross-sectional study carried out in the county of Joybr in 2009. Body max index, demographic, and socio-economic data of all students in year one (935 cases) were gathered using a check list. Data were entered into Excel and were analyzed by inferential statistics and t test using SPSS software. Only 78.1 percent of schoolchildren were in normal weight rate. 10.7, 5.5 and 5.8 percent of the remaining students were underweight, overweight and obese respectively. Highest and lowest rate of obesity were seen in private schools and rural area respectively. Highest and lowest rate of underweight were seen in urban area and private schools respectively. Double burden of nutritional disorders among studied schoolchildren are evident. Hence local managers need to be aware that our children in schools suffer considerably from both sides of nutritional disorders spectrum. Current programs are not sufficient to improve recognized problems. Therefore, interventional policies are required to be made to solve the problem of this vulnerable and important segment of the society.

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1. Introduction

Childhood is one of the most critical and important period of growth and development in human life. In this period any disorders in normal growth is a non-specific but important indicator of ill-health among children. Therefore measuring height, weight, and BMI (Body Mass Index) as the important measures of children's growth are important. The most reliable and frequently used method to measure normal weight is BMI (Mirmiran et al., 2004). BMI is measured by individual's weight on kilograms divided by the squared height of individual in meter. Based on this method BMI below the percentile 5 is considered as underweight, between percentile 15-85 as normal, between percentile 85-95 as obesity borderline and above percentile 95 as obese (Karaji Bani et al., 2005).

Like many other countries in the world, BMI is measured in Iran as routine for all children in schools (Low, 2010). Different organs of human body could be affected by obesity. The most important causes of death and disability in developed and developing countries such as hypertension, liver diseases of non-alcoholics, insulin resistance, dis-lipidemia and chardio-vasecular diseases, respiratory disorders and

psychological problems could be as results of childhood obesity (Han, et al., 2010; August et al., 2008). Meanwhile, social and psychological side-effects such as school leave, self-esteem reduction, loneliness, low progress in education (Azizi et al., 2002) and low level of quality of life (Morales et al., 2012; Ottova et al., 2011) seem to be related to school age obesity.

Like obesity, underweight is a chronic condition that in developing countries such as Iran, is one of important problem with high priority for public health (Hajian et al., 2008). Low energy uptake, hyperactivity, food habit, communicable diseases are the most important causes of underweight. Some diseases such as thyroid hyperactivity, gastroenteritis and chronic diarrhea could be the underlying factors for shortage of micro-nutrients including vitamins and minerals and therefore lead to stunning and underweight (Karaji Bani et al., 2005). While, from 1997 obesity has been mentioned as an important public health problem by WHO (Low, 2010), obesity and malnutrition have double burden in many low and middle-income countries (Wang and Lobstein, 2006; Senbanjo and Oshikoya, 2010; Ziaoddini et al., 2010; Rashidi et al., 2005). One study in Asia (Mak

and Tan, 2012) measuring the trends of weight change in a 20 years period, had reported the prevalence of underweight among children and adolescent and recommended specific public health policy to address the problem. Limited studies have reported double burden of nutrition disorders including overweight, underweight and stunting among youngsters and schoolchildren (Maddah et al., 2010; Motlagh et al., 2010). Hence, nutritional disorders is one of the world major public health concerns specifically in developing countries as well as in Iran (De Pee et al., 2010; Kelishadi, 2007; Jones et al., 2008; Bomela, 2009; Monterio, 2002).

The most important interventions related to weight disorders in childhood could encompass political leadership and support, funding for social marketing and support, monitoring, program evaluation, research and a strategy for integrating scientific evidence with multifaceted programs (WHO, 2009; Swinburn, 2009). Experts emphasis on collated approaches as a method for controlling obesity epidemic in childhood. Implementing such approach requires an enabling comprehensive public health policy making among local level managers. The situation that inter-sectoral and intra-sectoral cooperation are its prerequisites. In this article we investigate the BMI of children in elementary schools of Joybar county in Mazandaran province. Based on the finding of research recommendations for local public health manager's interventions for the control of problem are given.

2. Material and Methods

It was exploratory-explanatory cross-sectional study that was carried out in 2009 in all elementary schools of Joybar county in Mazandaran province. Normally students have health record in schools that is filled out from the start of their enrolment in schools by health posts of children health measurement supported jointly by ministries of Health and Education in Iran. Measuring height, weight and BMI of students are among the criteria

included in this health record. In this study all students from year one of both rural and urban area who had health record were studied. By attending at all schools and using a checklist for data collection, data related to predetermined variables of body measurement together with some demographic and socio-economic variables belong to students of year one were gathered. Gathered data were coded, extracted and entered in excel program. Inferential statistics and t test were used for analyzing data using SPSS software package.

3. Results

The total students of year one in this county in the year of study was 981 of which 935 (95.3%) had health record. The frequency table of students variables including sex, location of residency, type of school (public or private) is presented in table 1.

Table 1. frequency distribution of year one students having health record in Joybar county in 2008-2009

Frequency Variable	Number	Percent	
Sex	Boy	451	48.3
	Girl	484	51.7
Location of residency	Urban	420	45.0
	Rural	515	55.0
Type of school	Public	811	86.7
	Private	124	13.3
Total	935	100.0	

As table above indicates most of students were from rural area and attended in public schools.

Gathered data related to student's BMI in this study have revealed that just 78.1 percent of students were in the range of normal weight and the remaining were in underweight and overweight or obese with 10.7 and 11.2 percent respectively.

Table 2 shows frequency distribution of students BMI as dependent variable and variables such as sex, location of residency and types of school as independent variable.

Table 2. Frequency distribution of BMI based on explanatory variables of students in year one having health record in Joybar county in 2008-2009

BMI Percentile Variable		< Percentile 5	5-85 Percentile	85-95 Percentile	>95 Percentile	Total
		Number (Percent)				
Sex	Boy	51 (11.3)	352 (78)	20 (4.4)	28 (6.2)	451 (100)
	Girl	49 (10.1)	378 (78.1)	31 (6.4)	26 (5.4)	484 (100)
Location of residency	Urban	55 (13.1)	316 (75.2)	22 (5.2)	27 (6.4)	420 (100)
	Rural	45 (7.8)	414 (80.4)	29 (5.6)	27 (5.2)	515 (100)
Type of school	Public	94 (11.6)	631 (77.8)	42 (5.2)	44 (5.4)	811 (100)
	Private	6 (4.8)	99 (79.8)	9 (7.3)	10 (8.1)	124 (100)

Total	100 (10.7)	730 (78.1)	51 (5.5)	54 (5.8)	935 (100)
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As table above indicates both underweight and obesity were more prevalent among studied students of boys than girls, urban than rural. While underweight among public schools were more common than private schools. Obesity was also more common in private schools compared to public one. Although observed differences of BMI between groups were considerable, but statistical analysis of t test was not significant.

Concerning the double burden of student's weight among studied population, the situation is depicted in graph 1 as follows.

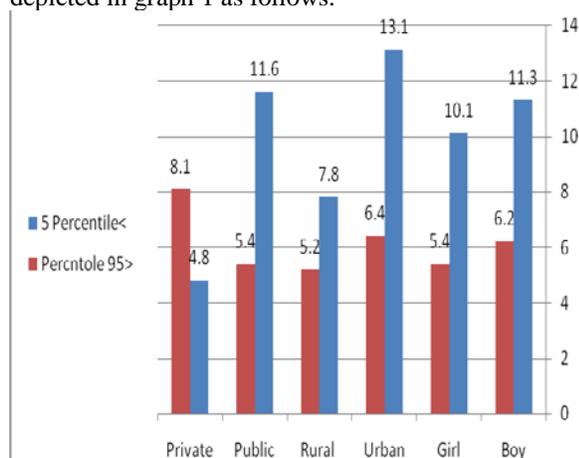


Figure 1. Distribution of year one students with abnormal BMI in Joybar county in 2008-2009

As figure above depicts double burden of weight among studied students have seen both in terms of underweight and overweight so that in private schools the problem of obesity was relatively more than the problem of underweight. In the other cases the burden of underweight was more among studied population.

4. Discussions

In the literature there are loads of studies carried out in recent years concerning the burden of obesity among different social groups. Studies focusing on the problem of underweight or both are limited where underweight in childhood could have side effect or burden on children's health. This issue is more relevant to developing countries and within countries to the less developed area and small towns. A limited number of studies have highlighted this problem for the country of Iran (Maddah et al., 2010; Motlagh et al., 2010). The findings of this study is in the line with other studies in Iran (Hajian et al., 2008, Baygi et al., 2008; Delavarianzadeh and Sadeghian, 2006) that has shown that obesity is prevalent among

children of elementary schools. This study has revealed that on average 5.8 percent of studied schoolchildren were obese that was higher than the amount reported by Maddah and Nikooyeh (2009) in Rasht (5.4%) and Ayatollahi and Mostajabi (2007) for 4.7% and Motlagh et al., (2010) for 3.4% . In terms of the prevalence rate of obesity among boys compared to girls (6.2% against 5.4%) the results of this study is different from the findings of Maddah and Nikooyeh (2009) but similar to the findings of Ayatollahi and Mostajabi (2007). The prevalence of obesity among schoolchildren of private schools that usually families with higher socio-economic background enroll their children in these schools was higher than those in public schools (8.1% relative to 5.4%).

In this study also it was found that obesity was more prevalent in children from urban area compared to children in rural area. This could be due to a better socio-economic status of urban population or more physical activity of rural schoolchildren because of environmentally more accessibility to such activities. Similar to other studies (Motlagh et al., 2010; Basiri Mogaddam et al., 2007; Rezaie et al., 2005), in addition to the obesity that has been found in this study the other findings has shown the problem of other end of spectrum that is underweight. Based on the findings of this study on average 10.7 percent of studied children had the problem of underweight that was higher than the amount reported by another study in Shahrood-Iran (Delavarianzadeh and Sadeghian, 2006) for 5 percent and less than the amount (19.1%) reported by Motlagh et al., (2010).

Also the finding of this study that indicated more prevalence of underweight in public schools and obesity in private schools could be probably an indication of a relation between families' socio-economic status and nutritional problems. This assertion is supported by other research findings carried out in Iran earlier (Hajian et al., 2008; Delavarianzadeh and Sadeghian, 2006). The existence of obesity and underweight among schoolchildren simultaneously denote to the double burden of nutritional disorders among Iranian children a problem that appropriate intervention for ratifying it has been insisted by other studies carried out in Iran and other countries (Motlagh et al., 2010; De Pee et al., 2010; Kelishadi, 2007).

Another point is that these problems were seen among different groups of students with no statistically significant difference in one group compared to another. This denotes that more attention needs to be paid to the growth and weight

up taking of all children in all schools for both underweight and obesity. Higher rate of obesity compared to lower rate of underweight found in this study compared to other studies in recent years as cited earlier could probably be an evidence for continued improvement in socio-economic status of families and will probably cause more obesity for children in the future. Therefore it is necessary that public health managers particularly those who have direct responsibility over children at district level choose appropriate policies and interventions to change the current situation by directing evidence based activities. In this regard different countries have implemented different programs. For example in Arkansas State (Swinburn, 2009) the law of students BMI checks and conveying the information to the parents is in place. Similar program was carried out in 2008 to 2009 in Britain. Another example is in Singapore that government has integrated the program of food education with education programs at school, promote physical activities, and has limited the accessibility to beverage and inappropriate foods. Children and parents are thought regarding physical activities and healthy eating and there are clinics for helping children with obesity (Low, 2010). In Canada, Nordic countries and Britain there are regulation that does not permit radio and TV program expose children with food industrial marketing. Improving food programs require to be supported by law and regulation (Low, 2010; WHO, 2009; Swinburn, 2009).

In the country of Iran school health program was the concern of both ministries of health and education for many decades. This program is currently followed through providing health record for students by a joint activity of ministries of health and education. The core objectives of this program is screening, case finding, patient referral, and following up the cases for all students across the country (Baygi et al., 2008). There are no reports on interventions and corrections of this program. Based on students health needs, appropriate interventions need to be implemented based on local and environmental conditions. According to the findings of this study and literature, the authors recommend that given the current situation some interventions such as teaching school children in the form of school curriculum, parents education through applicable teaching materials, food support of underweight children, programs for increasing physical activities of schoolchildren, control on food distribution facilities at school level should be implemented. Given the increase of obesity relative to underweight among students beside life style change, improving the physical activities of schoolchildren is more

important among those have been recommended. This might also be more important for the students of private schools because as it has been mentioned earlier as a consequence of better socio-economic status the prevalence of obesity is more prevalent among these students. Meanwhile they attend in private schools that the owner of such schools as concern of reducing the cost prefer to rent smaller space with less opportunity for physical activities during student attendance at school. Finally given the double burden of nutritional disorders found in this study, those who are responsible for the health of students both in ministries of health and education should be more sensitive to schoolchildren's health. They also need to be informed that our children at schools suffer both from underweight and overweight as the two ends of nutritional disorder spectrum. Therefore the current programs of school health do not address the recognized problems and interventional policies for solving the problems of this vulnerable group need to be provided.

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References

1. August GP, Caprio S, Fennoy I, Freemark M, Kaufman FR, Lustig RH, et al. Prevention and treatment of pediatric obesity: an endocrine society clinical practice guideline based on expert opinion. *J Clin Endocrinol Metab*, 2008; 93: 4576-4599.
2. Ayatollahi SM & Mostajabi F. Prevalence of obesity among schoolchildren in Iran. *Obes Rev*, 2007; 8: 289-291.
3. Azizi, F, Saadat, N., Salehi, P., Emami, H. The relation between glucose intolerance with indicators of hypertension, BMI, and the ratio of waist to bottom boundary in urban population of Tehran. *Iranian Journal of endocrinology and metabolism*. 2002; 3(4): 247-256. (Persian)
4. Basiri Mogaddam, m., Gahramany, m., Chamanzary, H., Badiiee, L. Survey of prevalence of malnutrition in children who study at grade one

- in Gonabad primary school in 2005- 2006. *Ofogh Danesh Journal*, 2007; 13(1): 40-46. (Persian)
5. Baygi, F., Eshraghian, M. R., Dorosty, A. R. Prevalence of obesity among school children in Neishbour (2005). *The Journal of Qazvin Univ. of Med. Sic.* 2008; 12(1): 73-76. (Persian)
 6. Bomela NJ. Social, economic, health and environmental determinants of child nutritional status in three Central Asian Republic. *Publi Health Nutr.* 2009, 12: 1871-1877.
 7. Delavarianzadeh, M., Sadeghian, F. The prevalence of Protein-Energy malnutrition and its determinants among elementary students, *Faslnameh Payesh*, 2006; 5(4): 263-269. (Persian)
 8. De Pee S., Brinkman HJ, Webb P et al., How to ensure nutrition security in global economic crisis to protect and enhance development of young children and our common future. *J Nutr*, 2010; 140: 138S-142S.
 9. Hajian, K. O., Sajadi, P., Rezvani, P. Prevalence of overweight and underweight among primary school children age 7-12 years (Babol; 2006). *Journal of Babol university of medical sciences.* 2008; 10(3): 83-91. (Persian)
 10. Han JC, Lawlor DA, Kimm SY. Childhood obesity. *Lancet*, 2010; 375: 1737-1748.
 11. Jones LL., Griffiths PL., Adair LS et al., A comparison of the socio-economic determinants of growth retardation in South African and Filipino Infants. *Publi Health Nutr.* 2008, 11: 1220-1228.
 12. Karaji Bani M., Montazerifar F., Mohammadi M., Dashipur AR. The prevalence of obesity and wasting in primary school girls in the city of Zahedan. *Tabib Shargh*, 2005; 6(4): 289-296. (Persian)
 13. Kelishadi R. Childhood overweight, obesity, and the metabolic syndrome in developing countries. *Epidemiol Rev.* 2007, 29: 62-76.
 14. Low L.C.K. Childhood obesity in developing countries. *World J Pediatr*, 2010; 6(3): 197-199. Available from: www.wjpc.com
 15. Maddah, M., Nikooyeh, B. Factors associated with overweight in children in Rasht, Iran: gender, maternal education, skipping breakfast and parental obesity. *Publi Health Nutr:* 2009; 13(2): 196-200.
 16. Maddah, M., Shahraki, T., Shahraki, M. Underweight and overweight among children in Zahedan, south-east Iran. *Publi Health Nutr*, 2010; 13(10), 1519-1521. doi:10.1017/S1368980010000388
 17. Mak, K.K. Tan, S. H. Underweight problems in Asian children and adolescents. *Eur J Pediatr*, 2012; 171: 779-785. DOI 10.1007/s00431-012-1685-9.
 18. Mirmiran, P., Mirbloki, M., Mohammadi, N. F., Azizi, F. Prevalence of underweight, overweight and obesity among youngsters in Tehran 1998-2001, *Iranian Journal of endocrinology and metabolism.* 2004, 5(4): 371-377. (Persian)
 19. Monterio CA., Conde WL., Popkin BM. Is obesity replacing or adding to undernutrition? Evidence from different social classes in Brazil. *Publi Health Nutr.* 2002, 5: 105-112.
 20. Morales, P. F., Sa´nchez-Lo´pez, M., Moya-Martı´nez, P., et al., Health-related quality of life, obesity, and fitness in schoolchildren: the Cuenca study. *Qual Life Res*, 2012; DOI 10.1007/s11136-012-0282-8
 21. Motlagh E. M., Kelishadi, R., Amirkhani, A. M., Ziaoddni. H., Dashti, M., Aminae, T., Ardalan, G., Mirmoghtadaee, P., Keshavarz, S., Poursafa, P. Double burden of nutritional disorders in young Iranian children: findings of a nationwide screening survey. *Publi Health Nutr.* 2010; 14(4): 605-610.
 22. Ottova, V., Erhart, M., Rajmil, L., Dettenborn-Betz, L., & Ravens-Sieberer, U. (2011). Overweight and its impact on the health-related quality of life in children and adolescents: results from the European KIDSCREEN survey. *Qual Life Res*, 2012; 21:59-69. DOI 10.1007/s11136-011-9922-7
 23. Rashidi A, Mohammadpour-Ahranjani B, Vafa MR, Karandish M. Prevalence of obesity in Iran. *Obesity Rev* 2005; 6 : 191-192.
 24. Rezaie, M., Poormahmoodi, A., Malekzadeh, J. M., Malekpoor, G., Yoosefi, A. Anthropometric survey on preschool children in Yasuj 1380. *Armeghan Danesh Journal*, 2005; 10(37): 29-36. (Persian)
 25. Senbanjo IO, Oshikoya KA. Physical activity and body mass index of school children and adolescents in Abeokuta, Southwest Nigeria. *World J Pediatr*, 2010; 6: 217-222.
 26. Swinburn B. Obesity prevention in children and adolescents. *Child Adolesc Psychiatr Clin N Am*, 2009; 18: 209-223.
 27. Wang YF, Lobstein, T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes*, 2006; 1: 11-25.
 28. World Health Organization. Population-based prevention strategies for childhood obesity. Report of the WHO Forum and Technical Meeting (Geneva, 15-17 December 2009).
 29. Ziaoddini H, Kelishadi R, Kamsari F, Mirmoghtadaee P, Poursafa P. First nationwide survey of prevalence of weight disorders in Iranian children at school entry. *World J Pediatr*, 2010; 6: 223-227.