

Nutritional Status and Menarche in Adolescents of Punjab

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ABSTRACT Malnutrition results from imbalance between the needs of the body and intake of nutrients. The present cross-sectional study was carried out on 417 girls, in the age range of 11 to 16 years and residing in Barnala and Mansa Districts of Punjab. The data was collected from January to April, 2010. The aim of the study was to assess the nutritional status of adolescent females on the basis of BMI - for - age and height - for - age and to determine the association between age at menarche and nutritional status (BMI - for - age). The menarcheal status (whether experienced or not) was taken as the criterion of maturity. Out of the total sample, 64.51 percent adolescent girls were thin and 44.36 percent girls were associated with minor stunting and 59.23 percent girls had experienced menarche. The median age at menarche of the present overall sample was 13.25 ± 0.65 years. The median age at menarche separately for undernourished and normal girls, was found to be 13.5 ± 0.7 years and 12.7 ± 0.5 years. It has been observed that menarche is delayed due to undernutrition and as the nutritional status improves, attainment of menarche is lowered.

INTRODUCTION

Nutrition has an important bearing on age at menarche. Adolescents gain 50 percent of adult weight and more than 20 percent of their adult height during this period (Story 1992). Menarche is attained earlier by well nourished adolescents (Bharati and Bharati 1998). A minimal amount of body fat is essential for ignition of menarche.

Eliminating hunger and malnutrition is one of the most fundamental challenges facing humanity (Lomborg 2004). Malnutrition refers to any disorder of nutrition-whether it is due to dietary deficiency, called under-nutrition, or to excess diet, called over-nutrition (Britannica Student Encyclopedia 2005). Malnutrition and its associated disease conditions can be caused by eating too little or eating an unbalanced diet that lacks necessary nutrients. Under nutrition is defined as failure to consume adequate energy, proteins and micronutrients to meet basic requirements for body maintenance, growth and development. Malnutrition among girls has long been recognized as a serious problem in India (Dewan 2008), but national-level data on levels and causes of malnutrition have been scarce.

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Objectives

The present study is an attempt to assess the Punjabi females as thin, obese, overweight and normal on the basis of BMI - for - age (Onis et al. 2007) and severely stunted, stunted, minor stunted and normal on the basis of height - for - age (Onis et al. 2007). This study is also aimed to determine the relationship between attainment of menarche and nutritional status evaluated on the basis of BMI - for - age.

MATERIAL AND METHODS

The present cross-sectional study was carried out in the Barnala and Mansa Districts of Punjab. The sample consists of 417 female adolescents (170 pre-menarcheal and 247 post-menarcheal) ranging in age from 11 – 16 years. The data were collected from January to April, 2010. Height and weight of all the subjects were measured by using standard techniques (Lohman et al. 1988). Nutritional status was calculated as BMI - for - age [$Wt (kg)/Ht (m)^2$] and height - for - age on the basis of WHO criteria (Onis et al. 2007). The adolescent girls were categorized into thin, obese, overweight and normal on the basis of BMI - for - age and severely stunted, stunted, minor stunted and normal on the basis of height - for - age. The median age at menarche of the overall sample and separately for undernourished and normal girls has been calculated through Probit analysis (Finney 1952).

Table 1: Nutritional status of 11 to 16 years old adolescent on the basis of BMI – for - age

Age	Pre-menarcheal girls					Post-menarcheal girls				
	N	Thin	Normal wt.	Over wt.	Obese	N	Thin	Normal wt.	Over wt.	Obese
11	38	25	8	2	3	10	3	4	1	2
12	65	43	14	6	2	26	9	11	4	2
13	37	28	7	2	0	27	12	7	5	3
14	12	10	1	0	1	56	32	18	5	1
15	9	7	2	0	0	59	44	6	4	5
16	9	8	1	0	0	69	48	15	5	1
Total	170	121	33	10	6	247	148	61	24	14

RESULTS

On the basis of BMI- for - age, out of the 170 pre-menarcheal girls, 121 girls were thin, 33 were normal, 10 girls were overweight and only 6 were obese. In post-menarcheal girls, 148 girls were malnourished, 61 were normal, 24 were overweight and only 14 girls were obese. In the case of Pre-menarcheal girls, as the age advances, the level of malnutrition decreases but in post-menarcheal group, the number of thin girls increases with age i.e. number of malnourished girls increases with advancing age during adolescence (Table 1).

The nutritional status was also assessed on the basis of height- for - age. In the pre-menarcheal girls, 7 girls were severely stunted, 35 were stunted, 74 were with minor stunting, 41 were normal and 13 were having taller for their age. In 247 post-menarcheal girls, 11 were severely stunted, 40 were stunted, 111 were with minor stunting, 65 were normal and 20 were having taller for their age. In the case of pre-menarcheal girls, stunting and severe-stunting increases from 11 to 12 years and then decreases with advancing age but in post-menarcheal girls it increases with advancing age during adolescence (Table 2).

More girls were thin and associated with minor stunting in both groups pre- as well as post-menarcheal at all ages. There were less number of girls who had normal height and weight, stunted but the least number of girls who had over weight and obese and were with severe and over stunting. It can be concluded that during pre-menarcheal years, larger percentages (71.18 percent) of the studied group were malnourished and 44.53 percent were associated with minor stunting and during post-menarcheal years, 59.92 percent were thin and 44.94 percent adolescent girls were associated with minor stunting.

Out of the total sample, 269 girls were thin and malnourished and 55.02 percent of these girls had attained menarche; 94 girls had normal weight in which 64.89 percent sample had experienced menarche and a larger percentage of sample, that is, 70 percent in both the cases were over weight as well as obese and had experienced menarche. Menarche had been attained by 59.23 percent (247/417) of the total studied sample (Table 3).

A total of 417 adolescent females were enquired whether they had experienced menarche or not and it was observed that 247 had experienced menarche. The median age of menarche

Table 2: Nutritional status of 11 to 16 years old adolescent on the basis of height – for - age

Age	Pre-menarcheal girls						Post-menarcheal girls					
	N	Severe stunting	Stunting	Minor stunting	Normal	Over height	N	Severe stunting	Stunting	Minor stunting	Normal	Over height
11	38	0	8	14	12	4	10	0	0	1	5	4
12	65	3	12	30	17	3	26	0	3	9	8	6
13	37	4	9	14	6	4	27	1	3	15	7	1
14	12	0	4	4	3	1	56	3	5	31	16	1
15	9	0	2	4	2	1	59	4	12	24	16	3
16	9	0	0	8	1	0	69	3	17	31	13	5
Total	170	7	35	74	41	13	247	11	40	111	65	20

Table 3: Relationship of BMI – for - age to attainment of menarche in adolescents

BMI group (kg/m ²)	Menarche attained		Total
	Yes	No	
Thin	148 (55.02%)	121 (44.98%)	269 (100)
Normal weight	61 (64.89%)	33 (35.11%)	94 (100)
Over weight	24 (70.59%)	10 (29.41%)	34 (100)
Obese	14 (70%)	6 (30%)	20 (100)
Total	247 (59.23%)	170 (40.77%)	417 (100)

Percentage in parenthesis

as calculated through probit analysis was 13.25 ± 0.65 years. The median age at menarche separately for undernourished girls, was found to be 13.5 ± 0.7 years and for normal girls was 12.7 ± 0.5 years. It shows that menarche is actually delayed due to undernutrition. Nutritional status has an important role in attainment of menarche. As the nutritional status improves, attainment of menarche is lowered. It has also been observed that as the BMI increased, the number of girls attaining menarche also increased. Thus, nutritional status is positively associated with attainment of menarche.

DISCUSSION

In the present study, 64.51 percent adolescent girls were thin, 44.36 percent girls were associated with minor stunting and menarche had been attained by 59.23 percent of adolescents. Undernutrition remains the problem of greatest concern in developing countries (Martorell et al. 1998; Tabak et al. 2000).

Delayed menarche may be a sign of malnutrition; since as nutritional status improves, the attainment of menarche is lowered. Ersoy et al. (2004) described that attainment of menarche decreases when BMI increases. There is a correlation between BMI and attainment of menarche and also, there is a correlation between early obesity and early onset of menarche. Girls with early onset of menarche had higher BMI than those with late onset of menarche (Lien et al. 2006; Sloboda et al. 2006). Age at menarche varies widely and is delayed in populations with poor nutrition (Thomas et al. 2001; Gluckman and Hanson 2006). Early menarche has been demonstrated to be associated with increased adult body mass index (BMI) in many longitudinal studies (Garn et al. 1986; Van Lenthe et al. 1996; Power et al. 1997; Laitinen et al. 2001; Okasha et al. 2001; Pierce and Leon 2005) and

cross-sectional studies (Wattigney et al. 1999; Mandel et al. 2004).

CONCLUSION

The results of the present study indicate that onset of menarche is delayed due to the malnourished status of the adolescent females. In these areas of Punjab, gender inequality in nutrition is present from infancy to adulthood. Women never reach their full growth potential due to nutritional deprivation. The results of this paper are in conformity with the studies reported earlier.

ABBREVIATIONS

BMI – Body Mass Index; WHO – World Health Organization; *Wt* – Weight; *Ht* - Height

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