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Assessment of Protein Energy Malnutrition among Children in Urban Community of Faisalabad, Pakistan

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Abstract: Protein Energy Malnutrition (PEM) in early childhood is spectrum of deficiency disease. At its one end there is kwashiorkor and on the other is nutritional marasmus, all the developing countries are at great risk of developing PEM among children. The main objective of study was to assess the nutritional status of primary school children. It was achieved by well designed questionnaire using anthropometric, dietary patterns and clinical signs of children belonging from different socio-economic statuses. Total 46 urban school age children less than 12 years were selected through simple random sampling technique. It was found that young children (both boys and girls) were suffering from PEM were under weight than that of their normal requirement. They use to belong to big family size as indicating unavailability of food or imbalanced nutrition because they hardly take milk or milk products; eat meat, vegetable, fat or cereal group food daily. Only a few children took iron/vitamin syrups. This was expressed in their anthropometric measurements. Most of the children usually lacked apathy impression of skin, turned their hair colour brown, white or grayish, dry and thin. They largely had: enlarged thyroid glands, hepatomegaly and splenomegaly pot belly. They usually had ailments during last six months. They use to face diarrhea, fever diseases and malaria. They mainly use to suffer from phagophagia. Therefore it is suggested that raising the awareness of policy makers on the current magnitude of child malnutrition, country wide and in special subgroups, at city level, enhancing food security by improving storage and distribution systems. Nutrition education should be enhanced thus enabling the individual to distinguish the balanced diet from a deficient one.

Key words: School age children, protein energy malnutrition, dietary patterns, food security

INTRODUCTION

The term Protein-energy Malnutrition (PEM) applies to a group of related disorder that includes marasmus, kwashiorkor and intermediate states of marasmus-kwashiorkor (Golden, 2011). Patients with PEM may also have deficiencies of vitamins, essential fatty acids and trace elements, all of which may contribute to their dermatosis. PEM is not a single disease but described a range of clinical disorder (Akhtar et al., 2005).

PEM also involves an inadequate intake of many essential nutrients. Low serum levels of zinc have been implicated as the cause of skin ulceration in many patients (Kuhl et al., 2004). In a 1979 study of 42 children with marasmus, investigator found that only those children with low serum levels of zinc developed skin ulceration. Serum levels of zinc correlated closely with the presence of edema, stunting of growth and severe wasting. The classic "mosaic skin" and "flaky paint" dermatosis of kwashiorkor bears considerable resemblance to the skin changes of acrodermatitis enteropathica, the dermatosis of zinc deficiency. In

kwashiorkor mortality tends to decrease as the age of onset increase (Gupta et al., 1987).

In some studies, the PEM prevalence among elderly person is estimated to be as high as 4% for those living in the community, 50% for those hospitalized in acute care units or geriatric rehabilitation units and 30-40% for those in long-term care facilities (Hanan et al., 2010). PEM has also been found to be a primary factor of poor prognosis in elderly person (Golden, 2011).

PEM is also associated with an increased likelihood of calciphylaxis, a small vessel vasclopathy involving mural calcification with intimal proliferation, fibrosis and thrombosis (Wilmer and Magro, 2002), as a result, ischemia and necrosis of skin occurs. Other tissues affected include subcutaneous fat, visceral organs and skeletal muscle (Goskowicz and Echenfield, 1993). Worldwide, the most common causes of malnutrition are inadequate food intake (Anwar et al., 2006). Preschool-aged and school going children in developing countries (Anwar and Awan, 2003) are often at risk for malnutrition because of their dependence on other for

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food (Akhtar *et al.*, 2001), increased protein and energy requirements (Benton *et al.*, 1998), immature immune systems causing a greater susceptibility to infection (Zahira *et al.*, 2012) and exposure to un-hygienic conditions (Chesire *et al.*, 2008).

The World Health Organization (WHO) defines malnutrition as "the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions (Onis *et al.*, 1993). The WHO's Department of Nutrition for health and development is responsible for formulating dietary and nutritional guidelines for international use. Adequate total nutrition includes the following nutrients protein, energy (calories), vitamins (Jolliffe, 1962).

Health experts say that the focus should be more on prevention of malnutrition, rather than trying to deal with the health consequence. They blame illiteracy, ignorance and parental neglect of children as some of the main causes of malnutrition." Awareness is still lacking about how long to breastfeed the child and when to start giving supplementary food. Lack of knowledge is a dangerous threat in itself," (Onis *et al.*, 1993).

Most important are protein and the caloric/energy requirement needed to utilize protein. If these elements are inadequate, the result is protein-energy malnutrition (PEM), or protein-calories malnutrition (PCM), which affects one in every four children worldwide, with the highest concentration in Asia (Zahira *et al.*, 2012).

Dermatologic findings appear more significant and occur more frequently among darker-skinned peoples (Gupta *et al.*, 1987; Ryan and Goldsmith, 1996). This finding is likely explained by the greater prevalence and the increased severity of PEM in third world countries and not to a difference in racial susceptibility (Kuhl *et al.*, 2004).

Depigmentation of hair causes it to be reddish yellow to white curly hair becomes straightened. If periods of poor nutrition are interspersed with good nutrition, alternating bands of pale and dark hair, respectively called the flag sign, may occur (Goskowicz and Echenfield, 1993). Also, hair becomes dry, lusterless, sparse and brittle; they can be pulled out easily. Temporal recession and hair loss from the back of the head occur, likely secondary to pressure when the child lies down (Ryan and Goldsmith, 1996). In some cases, loss of hair can be extreme. Hair can also become softer and finer and appear unruly. The eyelashes can undergo the same change, having a so-called broomstick appearance (Gupta *et al.*, 1987).

In both children and adults, the first step in the treatment of PEM is to correct fluid and electrolyte abnormalities are hypokalemia, hypocalcaemia, hypophosphatemia and hypomagnesaemia (Anwar *et al.*, 2006). Macronutrient repletion should be commenced within 48 hours under the supervision of nutrition specialists. The

second step in the treatment of PME (which may be delayed 24-48 h in children) is to supply macronutrients by dietary therapy (Chesire *et al.*, 2008). Milk based formulas are the treatment of choice. After 1 week, intake rates should approach 175 kcal/kg and 4 g/kg of protein for children and 60 kcal/kg of protein for adults. A daily multivitamin should also be added (Golden, 2011).

The present study aimed to estimate the prevalence of stunting and its correlates and to explore the role of sex basis in urban areas of south Pakistan.

MATERIALS AND METHODS
Present research was amid to find to the protein energy malnutrition among 5 to 12 years children in the local urban community of Faisalabad, Pakistan. The universe for the present study consisted of children who are 5 to 12 years of age and study in primary school. The pertinent information was obtained from two different schools of Faisalabad namely, Fahad Public School 308-A, Gulberg Colony and S.S. Secondary School, Bari 89. The purpose behind the selection of these areas was to have information about the different environment conditions in which child live. A sample size of 64 respondents selected through convenience sampling technique. The Questionnaire was in English language but later on explained verbally into Urdu language by the researcher herself. The data were analyzed, tables of percentage was applied to interpret the result.

RESULTS AND DISCUSSION
It was found in Table 1 that majority of the respondent (69.6%) were 5 to 10 years of age and 30.4% respondents were 11 to 12 years of age. It means major fraction of this population study comprised of young children. Akhtar *et al.* (2001), Anwar *et al.* (2006) and Anwar and Awan (2003) were of the view that PEM use to cause largely young children as adults can meet the balance diet have awareness what to eat to meet their nutritional needs.

Table 2 revealed that 47.5% respondents were male while 52.2% respondents were females. Both genders are in almost equal proportion for the aforementioned study. Hanan *et al.* (2010) and Golden (2011) were of view that PEM is independent of gender biasness; but Onis *et al.* (1993) reported that in some of the developing countries girls use to suffer from PEM as compared to boys due to socio cultural barriers.

It was found in Table 3 that 10.9 respondents were less than 15 kg, 46.5 respondents were less than 20 kg in weight, 8.7 respondents were less than 30 kg in weight and just 6.5 respondents were less than 35 kg in weight. This indicated that largely children are under weight than that of their normal required level of weight. Similar trends were narrated by Goskowicz and Echenfield (1993) and Chesire *et al.* (2008) that body weight is

Table 1: Distribution of the respondent according to their age

Age	Frequency	Percentage
5-10	32	69.6
11-12	14	30.4
Total	46	100.0

Table 2: Distribution of respondents according to their sex

Sex of respondent	Frequency	Percentage
Male	22	47.8
Female	24	52.2
Total	46	100.0

Table 3: Distribution of the respondents according to their weight

Weight of respondent	Frequency	Percentage
10-15	5	10.9
16-20	21	46.6
21-25	13	28.3
26-30	4	8.7
31-35	3	6.5
Total	46	100

Table 4: Distribution of the respondents according to their height

Height of respondent	Frequency	Percentage
103cm	10	21.7
104cm	7	15.2
105cm	14	30.4
107cm	9	19.6
108cm	6	13.0
Total	46	100.0

Table 5: Distribution of respondents according to their diet of milk and milk product

Milk and milk product	Frequency	Percentage
Daily	20	43.5
Alternate days	14	30.4
Weekly	14	30.4
Monthly	0	00.0
Total	46	100.0

Table 6: Distribution of the respondent according to their diet of meat groups

Meat group	Frequency	Percentage
Daily	7	15.2
Alternate days	9	19.5
Weekly	25	54.4
Monthly	5	10.8
Total	46	100.0

Table 7: Distribution of the respondents according to their diet of vegetable group

Vegetable group	Frequency	Percentage
Daily	11	23.9
Alternate days	16	34.8
Weekly	15	32.6
Monthly	4	8.7
Total	46	100.0

Table 8: Distribution of respondent according to their diet of fat group

Fat group	Frequency	Percentage
Daily	13	28.3
Alternate days	16	34.8
Weekly	14	30.4
Monthly	6	13.1
Total	46	100.0

the primary indicator for the health assessment of any child and children suffering from PEM were mainly below normal weight.

Table 4 showed that 50.0% respondents were in 4th to 8th no in his/her family, 32.6% respondents were in 9th to 13th no in his/her family and 17.4% respondents were in 14th to 18th no in his/her family. This shows that the population under study was having big family size due to which there are bright chances of malnutrition among the children, as large family due to economic stress could not meet the food needs of all family members. Same was found by Benton *et al.* (1998) and Akhtar *et al.* (2005) that in large family size parents could not meet the nutritional requirements of their children usually.

Table 5 revealed that 43.5% respondents used to take milk and milk products daily. 30.4% respondents take it on alternate days, while 30.4% respondents take it weekly. This trend dictates that hardly few children take milk or milk products properly. Like wise previous

indicator, here again economic burden stresses the parents to feed their children not to take milk as reported by Golden (2011) and Zahira *et al.* (2012) but Anwar and Awan (2003) were of the view that parents were not aware of the significance of the milk in daily diet.

It was found in Table 6 that 15.2% respondents eat meat daily, 19.5% respondents eat meat at alternate days, 54.4% respondents eat meat weekly and 10.8% respondents eat meat monthly. This trend dictates that hardly few children take meat properly. Jolliffe (1962) and Akhtar *et al.* (2001) were of the view that parents could provide the meat their children but they were not aware of the need of meat in the balanced diet of the children.

Table 7 showed that 23.9% respondents eat vegetable group daily, 34.8% respondents eat vegetables at alternate days, 32.6% respondents eat vegetables weekly and 8.7% respondents eat vegetable group monthly. This trend dictates that few children take vegetable group properly. Golden (2011) and Chesire *et al.* (2008) also pointed out that most of the children could not take vegetables frequently because of the dearness but Zahira *et al.* (2012) did not see eye to eye with them as they were not aware of the indispensability of the vegetables in human diet.

Table 8 showed that 28.3% respondents eat fat group daily, 34.8 eat fat group at alternate days, 30.4% respondents take fat group weekly and 13.1% respondents take it monthly. This trend dictates that only few children take fat group properly. These findings are in line with the findings of Akhtar *et al.* (2005) and Benton

Table 9: Distribution of respondent according to their diet of cereal group

Cereal group	Frequency	Percentage
Daily	29	63.1
Alternate days	6	13.0
Weekly	6	13.0
Monthly	5	10.9
Total	46	100.0

Total 10: Distribution of respondent according to vitamins and iron supplements

Vitamins or iron pills/syrup	Frequency	Percentage
Yes	13	28.3
No	33	71.7
Total	46	100.0

Table 11: Distribution of respondents according to the impression of skin

Impression of skin	Frequency	Percentage
Apathy	11	23.9
Pallor	17	36.9
Irritability	15	32.6
Any other	3	6.5
Total	46	100.0

Table 12: Distribution of the respondents according to their hair color

Colors	Frequency	Percentage
Brown	20	43.5
White	2	4.3
Grayish white	11	23.9
Black	13	28.5
Total	46	100.0

Table 13: Distribution of the respondents of the according to their hair condition

Hair condition	Frequency	Percentage
Dry	13	28.3
Thin	13	28.3
Dyspigmentation	7	15.2
Easily pluck able	13	28.3
Any other	46	100.0

Table 14: Distribution of the respondents according to the enlarged thyroid gland

Enlarged thyroid gland	Frequency	Percentage
yes	25	54.3
No	21	45.6
Total	46	100.0

Table 15: Distribution of the respondents according to the appearance of abdomen

Appearance of abdomen	Frequency	Percentage
Hepatomegaly	10	21.7
Splenomegaly	13	28.3
Pot belly	14	30.4
Any other	8	17.4
Total	46	100.0

et al. (1998) who stated that fat must be essentially included in human diet as most of the fat soluble vitamins are available in fats.

Table 9 revealed that 63.1% respondents take cereal group daily, while 13% respondents take cereal group at alternate days, 13% respondents take cereal group weekly and 10.9% respondents take cereal group monthly. This trend dictates that major fraction of children take cereal group properly. Akhtar *et al.* (2001) also confirmed that cereals play a significant role in the proper nutrition of the human diet as most the vitamins and minerals are abundantly available in the cereals, so cereals should be frequently included in the human diet. Table 10 revealed that only 17.7% respondents take vitamins or iron pills/syrup. This trend dictates that hardly a few children take vitamins or iron pills/syrup properly because of which most of the children could not compensate their nutritional needs. Same trend was described by Ryan and Goldsmith (1996) and Kuhl *et al.* (2004).

Table 11 revealed that 23.9% respondents have apathy impression of skin, 36.9% have pallor impression of skin, while 32.6% respondents have irritability and 6.5% respondents have any other impression of skin. It means one third of the population under study was suffering from apathy impression of skin. The reason might be the most probably PEM depicted in terms of anthropometric measurement. Similar signs have been described by Kuhl *et al.* (2004) and Ryan and Goldsmith (1996).

Table 12 revealed that 43.5% respondents had brown hair color, 4.3% respondents had white color,

32.6% respondents had grayish color of hair and 28.5% respondents had black color of hair. It revealed that almost half of the population had brown hair color. Gupta *et al.* (1987) and Kuhl *et al.* (2004) have also reported that due to PEM discoloration in hair have been observed.

Table 13 revealed that 28.3% respondents had dry hair, 28.3% had thin hair, while 15.2% respondents had dyspigmentation and 28.3% respondents had easily plucked able hair. It was evident that half of the population under study had dry and thin hair. Gupta *et al.* (1987), Ryan and Goldsmith (1996) and Kuhl *et al.* (2004) have also reported that due to PEM thin, dry and dyspigmentation in hair have been observed.

It was found in Table 14 that 54.3% respondents had enlarged thyroid gland and 45.6% respondents hadn't enlarged thyroid gland. It clarified that half chunk of the population under study had enlarged thyroid. Wilmer and Magro (2002) and Hanan *et al.* (2010) have fixed the responsibility of PEM of this enlarged thyroid gland.

It was found in Table 15 that 21.7% respondents had hepatomegaly, 28.3% respondents had splenomegaly 30.4% respondents had pot belly and just 17.4%

Table 16: Distribution of the respondents having ailments during last 6 months

Ailment	Frequency	Percentage
Yes	35	76.0
No	11	23.9
Total	46	100.0

Table 17: Distribution of the respondents according to the diseases

Disease	Frequency	Percentage
Diarrhea	10	21.7
Fever	10	21.7
Malaria	7	15.2
Any other	19	41.3
Total	46	100.0

Table 18: Distribution of the respondents according phagopagia

Phagopagia	Frequency	Percentage
Yes	30	65.2
No	16	34.8
Total	46	100.0

respondents had normal appearance of abdomen. It showed that about half of the population was suffering from hepatomegaly and splenomegaly. Zahira *et al.* (2012) and Anwar and Awan (2003) considered hepatomegaly and splenomegaly pot belly as indications of PEM among children and adults.

Table 16 revealed that 76% respondents hadailments during last 6 months and 23% haven't any ailments during last 6 months. It disclosed that major portion of population under study had ailments during last 6 months. Anwar *et al.* (2006) and Zahira *et al.* (2012) pin staked PEM as the casual of the ailments during last 6 months.

Table 17 revealed that 21.7% respondents had face diarrhea and fever diseases, 15.2% respondents had faced malaria, while 41.3% respondents had faced any other diseases. Jolliffe (1962) and Akhtar *et al.* (2005) referred as the diarrhea and malaria occurrence as the reason of PEM among children and adults.

Table 18 revealed that 65.2% respondents are suffering from phagophagia and 34.8% respondents haven't phagophagia. It discovered that a major portion of the population under study was suffering from phagophagia. Onis *et al.* (1993) and Hanan *et al.* (2010) assume that phagophagia used to happen due to PEM among children and adults.

Conclusion: It is concluded that:
I) The prevalence of PEM is common among the primary school children in urban areas of Faisalabad.
II) Poverty, lack of education seems to affect the child's susceptibility to the disease.
III) Poor dietary pattern that are being followed for children deprive them of the food items which are rich in proteins.
IV) Larger family sizes influence child's health.

Suggestions:
I) Raising the awareness of policy makers on the current magnitude of child malnutrition, country wide and in special subgroups.
II) At city level, enhancing food security by improving storage and distribution systems.
III) Nutrition education should be enhanced thus enabling the individual to distinguish the balanced diet from a deficient one.

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