RESEARCH PAPER

Assessment of nutritional status and dietary patterns of orphans residing in different orphanages of Lahore, Pakistan

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Abstract

The aim of this study was to evaluate the nutritional status, intake of energy and macronutrients of male and female orphans from orphanages in Lahore. Study was performed in 6 orphanages located in Lahore (Pakistan). The study involved 318 participants, 104 girls and 214 boys, aged from 5-14years. Nutritional status was assessed by anthropometric measurement including height, weight, BMI. BMI of respondents was compared to WHO Z-score tables and mean caloric and macronutrients intake was recorded thrice at alternative by using 24hour dietary recall questionnaire. The findings of current study shows that orphan males and females aged 14 years are at high risk of mal-nutrition. Their mean caloric intake is only 71% and 68% respectively of their RDAs. Mean BMI of 318 participants aged 5 to 14 years was 16.4±2. From whole population 279 participants (88%) had Z -score between -2 to 2 SD that suggest normal weight-for-height Z-score. Only17 participants (5%) had Z-score less than -2 SD that suggest moderate mal-nutritional status of participants and 20 participants (6%) had Z-score less than -3 SD that suggest severe mal-nutritional status of orphans and only 2 participants (1%) had Z-score more than 3 SD that suggest severely obese nutritional status of orphans. Overall nutritional status of male and female orphans and the dietary assessment of menus indicated that there is need of intervention in selected orphanages.

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Introduction

An orphan means a child who has lost one or both parents. This term is also known as a vulnerable child whose wellbeing, development, safety are compromised for various reasons (UNICEF, 2005). Orphanage is a living place or home where orphans who are vulnerable and deprived of their families live. Worldwide 148 million children ranging from infants to teenagers have been estimated as orphans (Khan *et al.*, 2014). It is found that HIV/AIDS has orphaned many children. On the other hand, conflicts, natural disasters, poverty, war, endemic diseases, maternal mortality have badly affected the life of many healthy and productive adults thus adding in the number of orphans (Lindblade *et al.*, 2003).

Orphanages are striving to fulfill the needs of orphans who are weak, vulnerable and work hard to care for themselves. There is great need for organizations to support and help these children in order to maintain their successful adult life. Most common problems faced by orphan children include loss of home, poor performance in school, problems with immunization and health, child labor, drug abuse, poor self-esteem, poor social network, lack of self-confidence, lack of healthy physical activities. In a study, it has been observed that there is a great difference of nutritional status among children who are living with their parents and orphans living in orphanages and institutes. These children are more likely to have micronutrients deficiencies than children living with their families (Vaida, 2013). Orphanages are responsible for providing healthy environment for children in which they can grow and develop their expertise adequately. Provision of nutritional education is very important for orphanages and these types of institutes. Childhood and adolescents are the most vulnerable group and they are more prone to develop nutritional deficiencies and worldwide average age group in orphanages fall between early childhoods to adolescents (Pysz*et al.*, 2015).

Monitoring physical growth and analyzing developmental parameters is an important factor to assess growth pattern in children. Health problems like excess weight loss and gain or improper weight gains are symptoms of improper growth (Sadowka*et al.*, 2010). Children are one of the important parts of any society. Their well-being, good nutrition, physical growth, mental development is crucial. They need proper care, healthy environment, happy family and home to grow and develop. Children nutritional status assessment is done by anthropometric measurements (measuring height and weight ratios), testing of biochemical marker, and screening for clinical symptoms. Stunting and wasting are two important manifestations regarding nutritional status (Higashiyama *et al.*, 2012).

Among the metabolic abnormalities micronutrient deficiencies are major pediatrics health concern. Studies have showed that most commonly found micro-nutrient deficiencies among children are iron and vitamin D deficiency and these deficiencies can have profound effect on child mental and physical health (Suskind, 2009). A Study was carried out to find out nutritional status of female orphans of Dhaka city, findings of study concluded that significant percentage of female orphans are micro nutrient deficient and have lower BMI along with lower hemoglobin level considered as malnourished and iron deficient females (Hussain, 2010). Iron deficiency and iron deficiency anemia (IDA) is major health concern worldwide. Iron deficiency anemia is quite common in growing children and it remains most common type of anemia in school going children. Iron deficiency itself without anemia can cause long term mental disabilities and behavioral problems (Lozoff B *et al.*, 2006). According to World Health Organization (WHO) anemia is defined as a "Hemoglobin level concentration 2 standard deviation (SDs) below the mean Hb concentration for a normal population of the same gender and age range" (WHO, 2001).

Malnutrition is a major concern of developing countries. Globally, one quarter of children under-five are malnourished. Malnutrition has become significant public health concern not only in poor countries but also in developed world. Adequate

nutrition during infancy, early childhood, adolescent is essential in the physical as well as emotional development of the child (Gabbad and Hassain, 2014). Pakistan's orphan statistics estimated that Pakistan hosts over 4 million orphans but unfortunately, there is lack of policy and protective legislation that is necessary for the safety of orphans. Orphans are vulnerable section of our society and there is great need for proper systems who will take charge of it. Pakistan must meet this requirement otherwise no progress is possible (Sayyid, 2015).

The aim of the study was to determine the adequacy of nutrient and energy intake and to assess the nutritional status of orphan children. Convenience sampling was done to select orphanages and sample size was selected by using proportional allocation technique.

Materials and methods
Study design
The research was conducted through cross-sectional survey design. Questionnaire was used as a tool for collection of data conducted in July 2016 to March 2017.Participants were the primary source of information. The study was carried out on three hundred and eighteen (318) orphan children of both male and female.

Study area
The current study was done in Lahore, Pakistan. Lahore is the capital city of Punjab province, around nine million of population, the 2nd largest resident area in the country. It is a main historical area in South Asia.

Study population
Orphanages
For the purpose of this study six orphanages were selected as sample population among twelve orphanages. Names of selected orphanages are given below;
AnjumanHimayat-e- Islam
Minhaj&Aghosh orphan care home
EdhiorphangeLahore for women (Bilquis)

SOS Villages Lahore
Jannat-ul-firdous for girls
Abba orphanage for girls
AnjumanHimayat-e-Islam, Minhaj&Aghosh orphan care home and SOS villages had both male and female population and Jannat-ul-firdous, Abba homes and Bilquisedhi homes had single gender female population.

Sampling and sample size
Sample size
Sample size determination: A representative sample of 318 orphan children was included in this study. Sample size was determined by using Solvin's formula;
$n= N/1+Ne^2$

This formula was used to determine sample size to be obtained from population. This formula was used to take into account confidence level and margin of error (Adanza, 1995).

Where n= desired sample size of children.
N= population size.
e= the desired margin of error.
According to data of present study the determination of sample size is given as follows;
The final sample size was 318 children residing in six selected orphanages of Lahore.
N=1557
e=0.05
$n=1557/1+1557(0.05)^2$
$n=1557/4.8925=318$
The total sample size was allocated among six selected orphanages (strata) by using proportional allocation technique given below;
$n=N1/N$
Where n= desired sample size
N1= orphanage 1 (stratum 1) (likewise N2…..N6)
N= population size.

By using above mentioned formula 28 participants were selected from SOS villages, 17 males and 11females, 133 participants were selected from DarulShafqat 67 males and 66 females, 133

participants were selected from MinhajAghosh Welfare foundation 4 females and 129 males, 10 female participants were selected from Janatul Firdous, 8 female participants were selected from Bilquiscentre Edhi, 6 female participants were selected from Abba Homes.

Sampling

Orphanages: Convenience sampling was used to identify the six orphanages for this study. The six orphanages which were selected among twelve orphanages were registered. The selected orphanages have been established for a long time, have relatively large number of orphans and allow research activities. The children residing in orphanages were the target group. The simple random sampling technique was used to select respondents from target group.

Data collection

Anthropometric measurements

Anthropometric measurements including weight, height and weight for height (BMI) and triceps skin fold (TSF) was recorded in Questionnaire.

Digital weigh machine was used to record weight and measuring tape in inches was used to measure height of respondents. Triceps skin fold thickness was taken by Big Red Apparel slim guide skin fold body fat caliper.

Dietary data

Daily nutrient intake of participants was recorded by using 24 hour dietary recall questionnaire. 24 hour dietary recall was taken thrice at consecutive days.

Inclusion criteria

For the purpose of study participants aged 5 to 14 years were included. The age groups selected for this study were most crucial age groups regarding their growth and development and nutritional stratus. Majority of orphans residing in selected orphanages of Lahore were belonged to these age sets.

Exclusion criteria

Participants suffered from any illness and recently recovered from any medical conditions were excluded from the study.

Data analysis

Data was analysis by Statistical package for social sciences SPSS version 22.0 and Excel. Descriptive statistics was used to assess data by SPSS Version 22.0.Graphs and figures were demonstrated by using Excel. Mean caloric and macronutrients intake of respondents was calculated and presented by using Excel.

Ethical consideration

Consent was taken after explained possible benefits and purpose of the study to participants. Participants were also guaranteed of anonymity and privacy of the information.

The names and addresses of orphanages were mention on the questionnaire after the permission. In addition all the data as a group in orphanages homes was reported jointly but all the information was kept confidential.

Results

In current study the data regarding nutritional status was collected from 318 male and female orphans residing in different orphanages of Lahore by using 24 hour dietary recall questionnaire. Anthropometric measurements including height, weight, body mass index BMI was recorded. BMI was compared with WHO (2007) Z-score tables to assess nutritional status.

Table 1. Age of respondents.

Age(years)	Frequency	Percentage
5 to 8	85	27%
9 to 13	190	60%
14	43	13%
Total	318	100%

Demographic characteristics

Participants were carefully interviewed regarding their demographic characteristics**.** Frequency of both male and female participants among different age groups has shown in graph below. It shows that 190 participants were between age group 9 to 13 years from which 127 were males and 63 were females, 85 participants fell between 8 to 5 years form which 54 were males and 31 were females and only 43 participants were 14 years old from which 32 males and 11 were females (Fig.1). 5 to 14 years of orphan children were selected and categorized in three age sets to participate in this study.

Majority of participants (60%) in this study were between age group 9 to 13 years, 27% were between 5 to 8 years and lowest (13%) percentage of participants were between 13 to14 years (Table 1).

Table 2. Triceps skin fold thickness status and count by gender.

	Gender		
Status	Female	Male	Total
M.M	7	1	8
N	98	212	310
Total	105	213	318

Table 3. Mean caloric and macro nutrient intake by gender.

Gender	Male	Female
Mean Energy Kcal intake	1399±228	1191±176
Carbohydrates (g)	181±34	144±26
Proteins(g)	62±11	54±10
Fats(g)	48±8	44±7

Assessment of nutritional status

Nutritional assessment of participants was done by taking 24 hour dietary recall and anthropometric measurements.

Anthropometric measurements

Weight for height of all participants was measured in term of BMI to assess nutritional status.BMI of population was compared to WHO (2007) Z- score **table**s to assess nutritional status. Mean BMI of 318 participants aged 5 to 14 years was 16.4±2. The graph below demonstrates that 279 participants (88%) from318 had Z -score between -2 to 2 SD that shows normal weight-for-height Z-score. 17 participants (5%) had Z-score less than -2 SD that exhibits moderate mal-nutritional status of participants and 20 participants (6%) have Z-score less than -3 SD that represents severe mal-nutritional status of orphans and only 2 participants were severely obese that had Z-score above 3 SD (Fig. 2).

Table 4. Mean energy (Kcal) & macro nutrients (g) intake of females by age groups.

Age group	5-8	9-13	14
Mean Energy (Kcal)	1094±173	1223±163	1226±163
Mean Carbohydrates(g) intake	131±26	149 ±24	152 ±25
Mean Protein(g) intake	51±10	55±9	54±11
Mean Fats Intake	41 ±7	46±6	44±7

Z- score of both male and female orphans was computed that shows 193 (61%) male participants and 86 (27%) female participants from 318 have Z-score between -2 to 2 SD that shows normal nutritional status and. 7 (2%) male participants and 10 (3%) female participants from 318 have Z-score less than -2 that shows moderate mal-nutritional status of orphans.11 (3%) male and 9(2.8%) female participants have Z-score less than -3 SD that shows severe mal-nutritional status of participants and only 2(1%) male participants have Z-score more than 3 SD that shows severe obese nutritional status of orphans (Fig. 3).

Table 5. Mean energy (Kcal) & macro nutrients (g) intake of males by age groups.

Age Group	5-8	9-13	14
Mean Energy (Kcal)	1339±236	1384±190	1565±277
Mean Carbohydrates(g) intake	171±34	178 ±27	205 ±43
Mean Protein(g) intake	60±12	61±9	68±11
Mean Fats Intake	46±8	47 ±7	52 ±9

Triceps skin fold thickness (mm)

Triceps skin fold thickness of respondents was recorded to determined body fat composition. The figure below demonstrates triceps skin fold thickness nutritional status of different ages. This bar chart represents that only 8 respondents were recorded less than 5th percentile of triceps skin fold thickness that shows moderate malnourished status while 310 respondents aged 5-14years had 5th to 95th triceps skin fold thickness percentiles that shows normal nutritional status.

This bar chart also represents that 50% of moderate mal nourished count aged 9 years (Fig. 4).

Table 6. Recommended dietary allowances (RDAs) by AHA.

Age group (years)	5-8	9-13	14 and above
Female	1200 kcal/day	1600kcal/day	1800kcal/day
Male	1400kcal/day	1800kcal/day	2200kcal/day

The table underneath illustrates that 7 female respondents and 1 male respondent of 318 population were recorded as moderate malnourished that shows that they had less than 5th percentiles of triceps skin fold thickness (Table 2).

Energy (Kcal) and macronutrients calculation by using 24 Dietary Recall

Mean caloric intake of 318 respondents aged 5 to14 years is 1331±228 and carbohydrates, proteins and fats intake in grams is 169±35, 59±11, and 46±7 respectively.

The table below illustrates mean and standard deviation of caloric and macronutrient intake of both males and females.
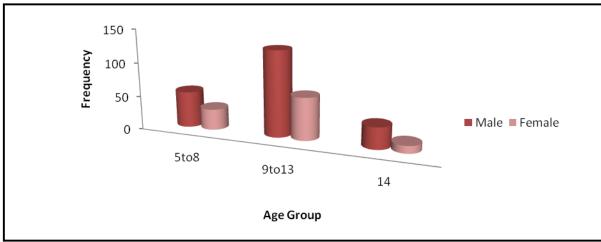

Fig. 1. Distribution of participants by age groups and gender.

The **table** 4 highlights slightly higher values of mean caloric and macro nutrient intake of male population. It was calculated that mean caloric intake of males was1399±228 while mean carbohydrates, proteins and fats intake was 181±34, 62±11 and 48±8 respectively, whereas female population had showed

slightly lower values. It was1191±176 value for mean caloric intake while mean carbohydrates, proteins and fats values were 144±26, 54±10 and 44±7 respectively.

Adequacy of macronutrients (g) intake by gender
It is calculated that intake of carbohydrates was slightly higher in male orphans while fat intake was slightly lower as compared to females but protein intake remained same in both genders.

The percentage of energy derived from macro nutrients in male populations is given in graph below that shows males had 52% of their energy intake from carbohydrates while 30% and 18% from proteins and fats respectively (Fig.5).

Fig. 2. Z -score of participants.

The percentage of energy derived from macro nutrients in female populations is given in graph below that shows females had 49% of their energy intake from carbohydrates while 33% and 18% from proteins and fats respectively (Fig.6).

Percentage of energy derived from macro nutrients

(g) by gender and age groups
Mean caloric and macronutrients calculations highlighted slight difference of values among different age groups of females in table given below.

It was 1094 Kcal for 5 to 8 year group, 1223 Kcal for 9 to 13 years and 1226 Kcal for 14 years old females.
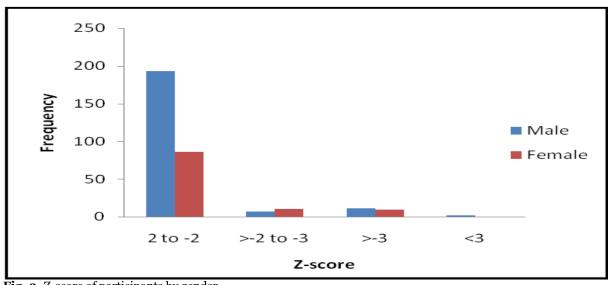

Fig. 3. Z-score of participants by gender.

Carbohydrates, proteins and fats intake of 5 to 8 years of females was 131±26, 51±10 and 41±7 respectively, while 9 to 13 years of female had reported to have carbohydrates, proteins and fats intake149±24, 55±9 and 46±6 respectively. 14years of females had carbohydrates, proteins and fats intake152±25, 54±11 and 44±7 respectively.

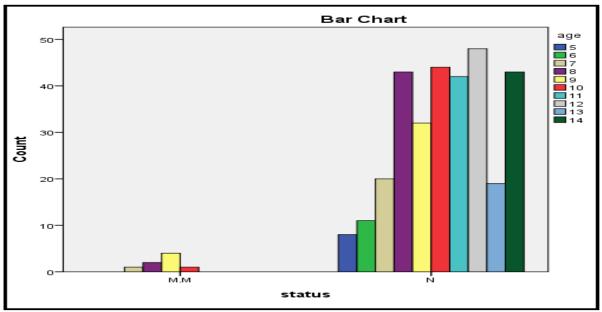**Fig. 4.** Triceps skin fold thickness status of orphan children by age.

Results had showed that females aged 5 to 8 and 9 to 13 years derived same percentages of energy from carbohydrates, proteins and fats which were 48%, 18% and 34% respectively while 14 years old females derived slightly higher percentages of energy from carbohydrates, and fats which were and 32% respectively while proteins intake neither changed among different age groups of female population (Table 4). The results in graph below clearly depicts that protein intake was remained same in different age groups. Carbohydrates and fat intake of the subjects was fluctuating between the different age groups which might have an impact on body fat composition.
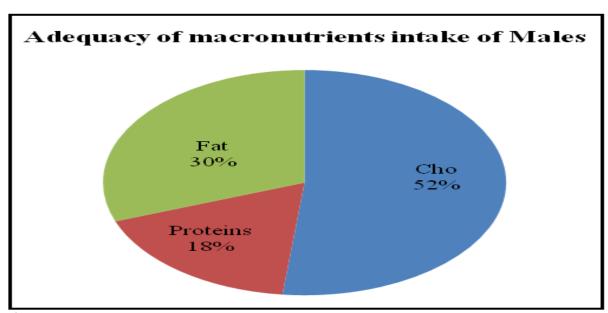

Fig. 5. Macronutrients intake of males.

It is calculated that male population had also showed slight difference of mean caloric Intake among different age groups it was 1339 Kcal for 5 to 8 year group, 1384 Kcal for 9 to 13 years and 1565 Kcal for 14 years old females. Carbohydrates, proteins and fats intake of 5 to 8 years of male orphans were 171±34, 60±12 and 48±8 respectively, while 9 to 13 years of male orphans had reported to have carbohydrates, proteins and fats intake178±27, 61±9 and 47±7 respectively. 14years of males had carbohydrates, proteins and fats intake 205±43, 68±11 and 52±79 respectively (Fig. 7).
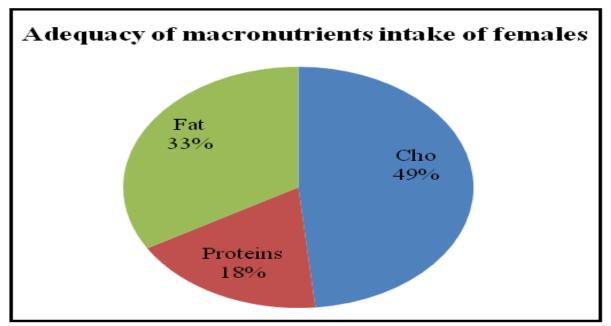

Fig. 6. Macro nutrient intake of females.

The **Table**-6 demonstrates that males aged 5 to 8 and 9 to 13 years derived same percentages of energy from carbohydrates, proteins and fats which were 51%, 18% and 31% respectively while 14 years old males derived slightly higher percentages of energy from carbohydrates which was 53% while protein and fats percentages were slightly lower which were 17% and 30% respectively that showed inverse proportion.
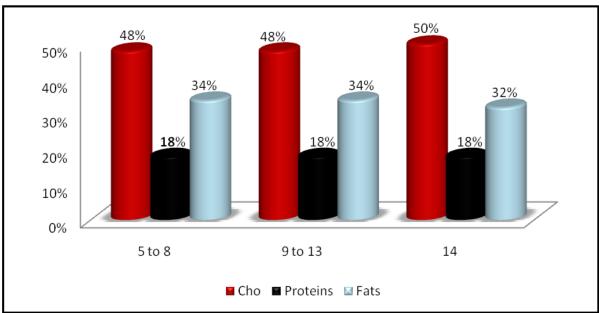

Fig. 7. Energy percentage derived from macro nutrients of females by age groups.

Results revealed decrease in percentages of proteins and fats with an increased in age that may have impact on anthropometric measurements on male subjects (Fig-8).

Recommended Dietary Allowances (RDAs) for children
According to AHA American Heart Association (2016)

RDAs/day according to age and gender is given Table 6.

The mean caloric intake (Kcal) of both genders and each age set was calculated and compared to the recommended daily allowance of American Heart Association (2016).
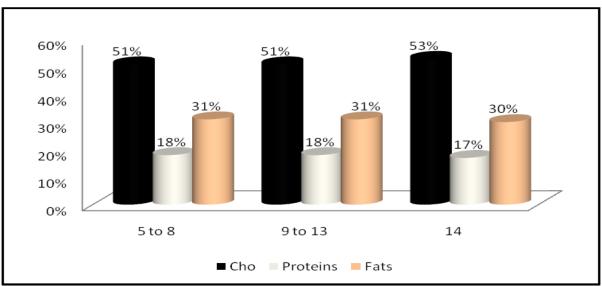

Fig. 8. Energy percentage derived from macro nutrients of males by age group.

The graph below illustrates comparison between mean caloric intake and RDAs of female subject which depicted that female orphans aged 5 to 8 years were receiving calories 91% of their RDA while the female orphans aged 9 -13 years and 14years were

receiving calories 77% and 68% of their RDAs respectively which were quite low and also indicated that female orphans aged above 9 years are at higher risk of developing mal nutrition (Fig. 9).
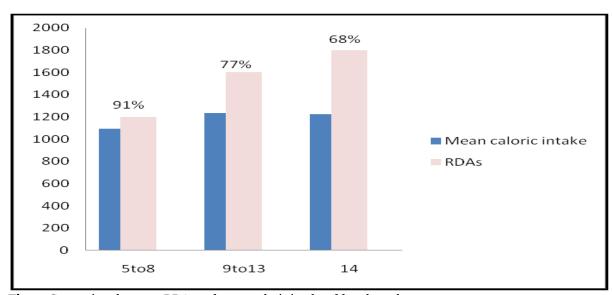

Fig. 9. Comparison between RDAs and mean caloric intake of female orphans.

The bar graph (Fig.10) demonstrates that caloric intake of male orphans were higher than females orphans. Males aged 5-8 years were receiving 96% of RDAs while male orphans aged 9-13 years were receiving 72% of RDAs and 14years old orphan males had 65% of the RDAs. This graph shows that orphan males specifically aged 9 to 14 are not taking adequate calories according to RDAs.

Comparison of mean caloric intake among female orphanages
The mean energy levels of different female orphanages was calculated and compared with each

other and has presented by graph underneath. This graph illustrates that female orphans residing in orphanage 2 were receiving 1222 Kcal which were slightly higher as compared to other orphanages while females of orphanage 1,3,4,5 and6 were receiving 1212, 1207, 1116, 1175 and 874 Kcal respectively (Fig.11).

The Fig.12 demonstrates that mean energy intake of male residing in orphanage 3 was higher than other orphanages. Males of orphanages 3 had 1436 Kcal while males of orphanages 1 and 2 had reported to take 1333 kcal and 1390 kcal respectively.
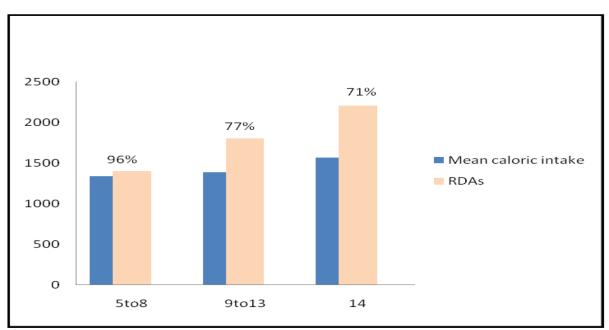

Fig. 10. Comparison of RDAs and mean caloric intake of male orphans.

Discussion
In the current study sample of 318 orphans consisted of both male and female orphans randomly distributed between age 5 and 14 years. Majority (67%) of population was of male orphans and remaining 33% of population was of female showing higher number of vulnerable and abandoned boys than girls. Similar results were seen in study carried out in Uturu, Abia state where male orphans were 60% whereas female were only 40% (Enwereji, 2010) but present study did not correspond with results of study in Rakki district of Uganda were female orphans were more than 50% of study population (Kikafunda and Namusoke, 2006). Boys especially

those above thirteen years of age require higher energy intake than girls of the same age. The study was carried out in six orphanages namely SOS villages, Minhaj welfare foundation, Abba Homes for girls, JanatulFirdous, EdhiBilquis homes for girls, DarulShafqat. Overall there were 20-33 caretakers was present in each orphanages. Caretakers were employed for 24 hours to take care and pay full attention on orphans.

In the present study mean energy intake of orphan children aged 5 to 12 was slightly lower than their RDAs. BMI of all respondents was recorded and compared to WHO (2007) Z-score tables and finding

shows that mean BMI of 318 participants aged 5 to 14 years was 16.4±2. From whole population 279 participants (88%) had Z -score between -2 to 2 SD that suggest normal weight-for-height Z-score. Only17 participants (5%) had Z-score less than -2 SD that suggest moderate mal-nutritional status of participants and 20 participants (6%) had Z-score less than -3 SD that suggest severe mal-nutritional

status of orphans and only 2 participants (1%) had Z-score more than 3 SD that suggest severely obese nutritional status of orphans. The findings of present study corresponds to another study recently conducted in Krakow among 5 orphanages including 153 respondents aged 7-20 years shows 80% of the male and 90% of female orphans had normal BMI (Pysz*et al.*, 2015).
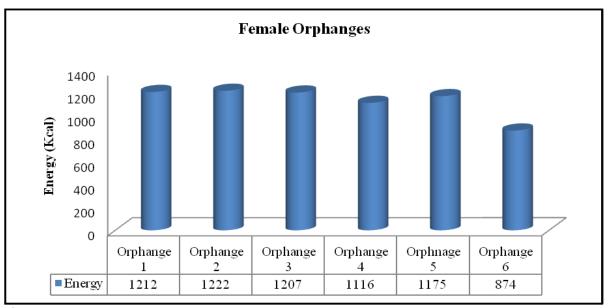

Fig. 11. Mean energy intake of female orphanages.

Overall population fall in normal BMI but their mean caloric intake 1298±229 was recorded as an inadequate as compared to their RDAs. The results of present study clearly show that protein intake was neither changed in genders nor in different age groups. Mean protein intake of all respondents of different age group was 17%-18% of their mean caloric intake showing that orphans above than 10 years of age especially male orphans are at high risk of developing protein energy mal-nutrition. Fat intake of the subjects was fluctuating between the different age groups which might have an impact on body composition. Mean carbohydrates and fat intake of respondents according to age and gender was recorded as adequate. The data of present study did not concur with results of study conducted in 2015 among five orphanages of Krakow showing very high protein intake more than 18% of total calories but their calories from carbohydrates and fats did not meet their daily energy requirements (Pysz*et al.*,

2015).

RDAs for both male and female orphans of each age set was compared with their mean energy intake and results revealed that orphan females aged 5 to 8 years met 91% of their energy intake whereas mean energy intake of females of 9 to 13 and 14 years were meeting 77% and 68%of their RDAs which was recorded as poor adequacy of caloric intake that could results in severe malnutrition in female population. Similarly male population aged 9 to 13 and 14 years were receiving 77% and 71% of their RDAs respectively. Findings of present study are similar as many literatures but this contradicts with research project conducted in Durban in 2013 that shows 14 years of boys living in residential care did not meet their RDAs level (Grobbelaar and Oldewage-Theron, 2013).Inadequate energy intake of orphans could have contributed to poor nutritional status among boys than girls mainly because boys (above 10 years

of age) require more energy than girls of the same age (FAO, 2004). Mal-nutrition progresses with age, it was assumed that more girls than boys of same age were mal nourished in their childhood. It was also noticed that condition of orphanages was less optimal contributing chronic mal-nutrition among orphans. The present study also showed that consumption of cereal food group fell far below the recommendation of food based dietary guidelines. It was also recorded that orphans of different orphanages did not consumed fruits on regular basis the findings are comparable to those of the 1999 micronutrient survey, in which low fruit consumption is reported in Kenya (UNICEF,2007).
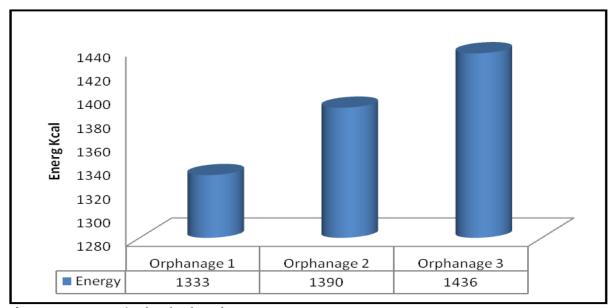

Fig. 12. Mean energy intake of male orphanages.

In the current study lunch had provided with higher proportion of calories compared to other meals for the Pakistan school children (UNICEF, 2009). The mean energy intake of both male and female orphans according to age groups above 13 years didn't meet the energy requirements. However, female orphans aged 5 to 8 years meet 91% of their RDAs whereas male orphans of same age meet 96% of their RDAs .Food that provide all macro and micronutrients is very important for orphan children to ensure good health. Orphans whose energy did not meet recommended intake indicates that even menus of orphanages provide variety of food but for some children the diet was still inadequate. It could also be suggested from present finding that male and female orphans especially aged 14 years who only meet 71% and 68% respectively of their energy requirement compared to RDAs were at risk of suffering from nutritional deficiencies. The orphans who were not meeting their caloric requirements were possibly not eating enough calories due to poor dietary practices.

Fewer orphanages including SOS villages and Darulshafqat for boys served with four or more food group. These results are alike to a Pakistan study which found 42.2% of school children consumed four or more food groups (Mwaniki, 2014). Orphans who consumed food from all food groups had a lower risk of being mal-nourished compared to those who took foods from less than four food groups. The consumption of a varied diet is associated with increased intake of energy and better health. It was recorded from recent study that orphan children were served with large portions of starchy cereals including legumes and starchy vegetables like potatoes because they are bulky thus giving satiety value.

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