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TO ANALYZE PAKISTANI CHILDREN UNDER 2 YEARS OF AGE CONSUME FOOD GROUPS HIGH IN ENERGY AND LOW IN MICRONUTRIENTS.

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ABSTRACT

BACKGROUND: In Pakistan, the prevalence of malnutrition is very common in children. In youngster's, studies conducted on food consumption permits propose methodologies on bolstering to enhance their nutritious status. **OBJECTIVE:** The purpose of the study is to assess the consumption of beverages and food groups high in energy and low in micronutrients in Pakistani children < 24 months of age. **METHOD:** A cross sectional study (n=548) conducted in 2023 in different hospitals of Lahore, Gujranwala and Sheikhupura targeting children < 24 months of age. The tool use to obtain dietary information was 24 hour dietary recall. The total food intake was categorized into 17 groups. Utilization was evaluated in milliliters or grams, kilocalories every day, and rate of vitality (PE) every day. The total food intake of every child was calculated for every nutritional category and stratified by age (less than 6 months, 6-11 months and 12 to 23 months) and if they are breastfed or not breastfed. Contrasts in the utilization of nourishment gatherings were analyzed by the status of breastfeeding, territory of home (rural or urban), and financial status (SES) by the mean of Linear regression balanced for age, status of breastfeeding, and review plan of survey designed. **RESULTS:** According to this survey, about 43% of the children are breastfed. While no. of children <6 months of age consuming infant formula is 43 % which is considered a larger percentage as breastfed children overall from 0-23 months are consuming breast milk. The percentage of nondairy sugar sweetened beverages among children is very low about 1%. The PE of cereal based preparations is very high in urban areas about 40 % and maize based preparations are very high in rural areas. Sweetened cereal consumption is very high in high socioeconomic status children which is about 50% than middle and low socioeconomic children which is about 20% and 10% consumption of sweetened cereals. **CONCLUSION:** According to survey conducted in Pakistan the children under the age of 2 years about 23 months are at high risk of malnutrition and they do not consume the food as recommended as the under and overconsumption of food is now leading to malnutrition, maladapted practices like consumption of water and other complementary foods in children 0-6 months is also leading to malnutrition like stunting, wasting, underweight and overweight children.

KEYWORDS: Beverage consumption, Pakistan, Food groups, Breastfeeding, Complementary feeding.

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INTRODUCTION:

The period from birth to 24 months of life is developmental period for children, because at this stage children undergo intellectual, physical, social and emotional development. All of these developmental stages require proper nutrition for optimal progress. Any fluctuation in feeding practices may result in undernutrition or over nutrition and it will ultimately result in negative health consequences. In developing countries, like Pakistan, poor food intake, low socio-economic status (>30%), low literacy rate 49% (men 63%, women 36%), infectious diseases (e.g., diarrhea) leads children towards improper growth[1]. But on the other side, children of developed countries become overweight and obese due to increase food consumption. China has 120 million children which are overweight and obese [2]. According to national nutrition survey (NNS) Pakistan 2018, the prevalence of stunting (height for age) was 40.2%, wasting 17.7% Underweight (weight for age) 28.9% and overweight (weight for height) 9.5%[3]. According to Scaling up Nutrition (SUN) annual progress report 2016, Nigeria has 32.9% stunting, 7.9% wasting, and 1.8% overweight. Similarly, Indonesia has stunting 36.4%, wasting 13.5% and overweight 11.5%[4]. In low socioeconomic status countries, the rate of stunting, wasting, overweight is 26%, 18% & 11%, respectively [5].

Studies shows that eating habits, preferences and taste development occurs in first five years of life and it will continue throughout the life[6, 7]. So, it is the responsibility of care givers to teach good eating habits to children. Unfortunately, eating habits are not according to recommendations in Pakistan like high consumption of candies cookies and beverages but low consumption of fish, whole grain and vegetables. Due to bad eating habits, children are not getting their required amount of nutrients. People with low socio-economic status are unable to eat properly, therefore they are more susceptible for micro & macronutrients deficiencies that will lead towards diseases. According to studies, Zn deficiency may result in seizures, diseases of immune system, impaired GIT development, and impaired brain development[8, 9]. Similarly, protein deficiency may lead children to impaired growth, altered metabolism, protein energy malnutrition, kwashiorkor and marasmus[10].

After 06 months of age, breast milk only will not enough to meet the nutrient needs of infants & children, so extra complementary food choices should be added with breast milk[11]. Studies shows that breastfeeding practices is high in rural areas as compare to urban areas, but urban areas have higher rates of weaning practices (solid and semisolid food) 70% as compare to rural areas (58%), due to which prevalence of malnutrition is comparatively low in urban areas[12]. Proper nutrition has good impact in early stage of life, because it will help children to meet their maximum growth potential and save them from infectious diseases as children at this stage is more susceptible. Fortified foods can help in combating malnutrition. Studies shows that children after 6 month of age which are taking only breast or formula milk is more susceptible for iron deficiency anemia

(IDA). To prevent from IDA, children after 6 month of age should start weaning practices and low-income families can use fortified products to meet iron requirement of their children[13, 14].The objective of this study is to describe the consumption of food groups in Pakistan children with <24 month of age.

METHODS

Study Design and Population

The cross-sectional study (n=548) conducted in Lahore, Gujranwala and Sheikhupura region among children <24 months of age from different Hospitalized setups.

Dietary Information

Data was collected by using 24-hour dietary recall from parents. Food quantity is measured by homemade measuring tools and then converted to grams and ultimately milliliters.

Food groups

Foods are divided into 17 different groups, of which 10 groups consists of Legumes, cereals, fortified foods, cookies other than maize, fruits and vegetables, snacks and deserts etc. were included. Rest 7 are the beverages which includes (infant formula milk, breast milk and other milk like cow's buffalo's), Dairy sugar sweetened and non-dairy sugar sweetened beverages (No sugar added or caloric free sweetened) and plain water.

Other variables

Breastfeeding: During mothers interview, we ask child is on mother milk or not.

Area: We ask a question about their residence area whether he/she lived in rural or urban area.

Socioeconomic status: In every country, socioeconomic status is divided into three categories low, medium and high SES.

Region: The data (n=548) is collected from different hospitals of Lahore, Gujranwala and Sheikhupura.

Nutritional status: Nutritional status of child whether he/she is under weight, overweight, wasted, stunted and normal is based on their anthropometric data, gender and age. We compare the child data with WHO growth standards 2006 and then choose their nutritional status(15).

Ethical considerations: The data in this survey is collected by interviewing the guardians of children's. Survey protocols approved by department of food sciences and human nutrition in university of veterinary and animal sciences Lahore. Dr Azmat Ulla khan was Supervise this survey.

Statistical analysis

In this study, SPSS version 25 was used for statistical analysis.

RESULTS:

About half of the children belongs to age group <6 month which is about 42%, 36.13% fall in 12 – 23 month and 21.89% from 11 – 23 month of age. More than 85% population lived in urban areas and remaining 14% in rural areas. Data shows that 45% children's having normal nutritional status, 24.5% children's are wasted, 21%children's are stunted, 18.43% are obese and only 17.51% children are underweight.

Percentage of Consumed food groups

Results shows that 65.7% are breastfed, 43% are on formula milk 12.6% children are on cow, buffalo or goat milk <6 months of age. In children 6 -11 month of age, the breast milk consumption is 48.3%. Only 23.3% guardians use infant formula because they have another cheap option of non-breast milk (Cow, Buffalo and Goat milk) to fulfill the dietary needs of their children. The percentage of non-breast milk consumption is 41.7%. Only 15.7% children that belongs to 12-23 month of age are on mother milk because this age group is able to tolerate the solid foods and digest them properly so their guardians prefer to give them soft and solid foods along with non-breast milk instead of formula milk. Non breast milk consumption is high in this age group which is 63.4% higher than other 2 age groups.

Food group's consumption

In table 1, the amount (ml/g) of food consumed other than breastmilk 176.99 ± 94.91 for < 6 month, 172.98 ± 110.27 for 6 – 11 month and 163.99 ± 124.16 for 12 – 23 months children's. Total amount of

liquids foods consumed excluded breast milk is 159.59 + 118.978.

High amount of breast milk is consumed by < 6-month of age as compared to 12 – 23-month children's. Infant formula is 2nd highly consumed liquid food observed. Cereal base products, sweetened cereals breads and non-breast milk is highly consumed among 12 – 23 month children's. SSB consumption is very low in all age groups. Energy intake by all liquid foods excluded breast milk is 120.62 ± 63.36 for children aged < 6 month, 106.60 ± 64.94 for 6 – 11 month and 122.70 ± 82.82 for 12 – 23 month age children's. Main energy source among < 6 and month children's is only breast milk and infant formula 189.22 ± 123.41 because they are unable to eat or drink any other food

Energy, k.cal/d				
	0-23 month (n=548)	**<6 month (n=230)**	**6-11 month (n=120)**	**12-23 month (n=198)**
Beverages calories/d				
Infant formula	179.65 ± 121.80	189.22 ± 123.41	132.83 ± 89.13	197.00 ± 140.89
Milk (non–breast milk)	216.12 ± 137.36	188.86 ± 149.29	232.00 ± 113.92	215.87 ± 143.07
Dairy sugar-sweetened	89.31 ± 55.91	-	77.20 ± 43.72	91.38 ± 59.09
Nondairy sugar-sweetened beverages	73.17 ± 24.78	-	-	75.80 ± 26.75
Nondairy sugar-free	-	-	-	-
Plain water	-	-	-	-
Solid foods, calories/d				
Legumes and seeds	102.60 ± 63.03	-	85.87 ± 64.80	104.78 ± 63.95
Fortified foods (cereals and porridges)	89.89 ± 67.06	-	97.00 ± 65.72	92.36 ± 70.43
Sweetened cereals, sweet bread, and Cookies	134.19 ± 149.53	70.00 ± 14.14	64.85 ± 47.36	167.05 ± 170.04
Cereal-based foods other than maize	125.99 ± 70.82	80.00 ± 0.00	116.19 ± 64.38	129.36 ± 72.75
Fruit and vegetables	79.23 ± 51.59	75.00 ± 30.00	70.50 ± 28.32	81.03 ± 55.89
Meat products	90.77 ± 48.61	-	56.67 ± 34.38	94.43 ± 48.94
Snacks and desserts	157.50 ± 143.36	-	132.89 ± 97.70	169.16 ± 161.67
Mixed foods (combination of meat, cereal, and vegetables)	109.33 ± 25.71	-	-	109.33 ± 25.71
Broths and soups	67.50 ± 37.52	-	-	67.50 ± 37.52
Maize-based preparations	-	-	-	-

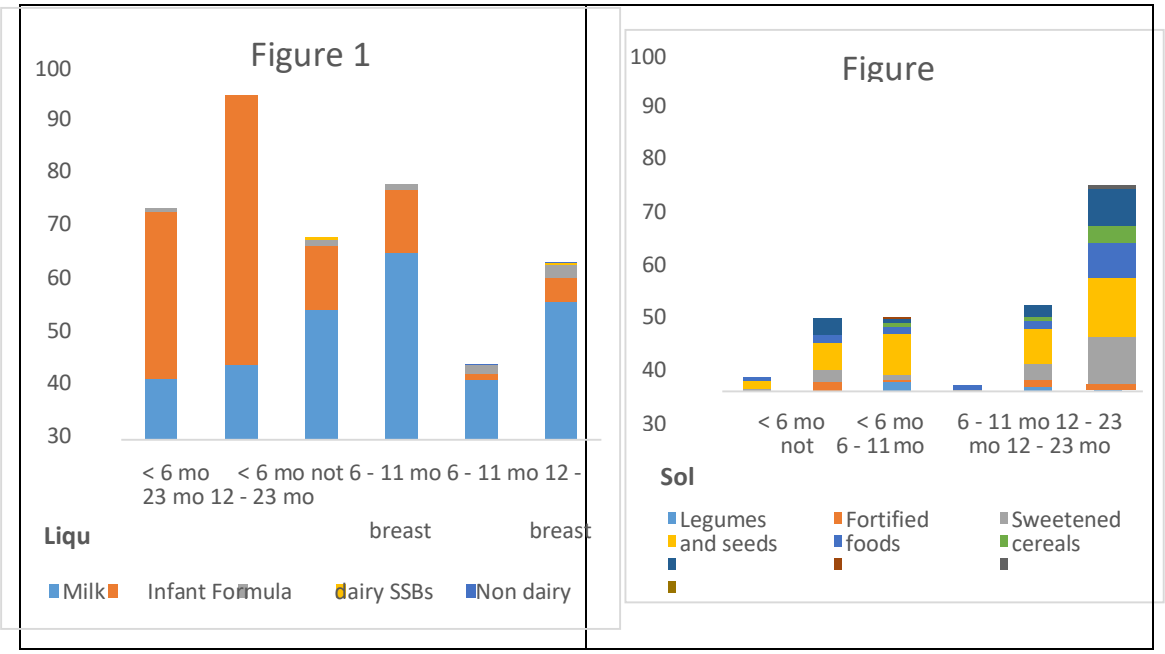
items at this age. Children aged 6 – 11 months not use solid food energy consumed by infant formula is132.83 ± 89.13. In 12 – 23 month children's, the main source of energy is non breast milk, cereal based foods other than maize, fruits & vegetables, sweetened cereals, sweet breads, cookies and minimum energy intake is fulfilled by meat, broth and soups. Energy consumption from non-breast milk, sweetened cereals, legumes & seeds and snack & desserts is

215.87 ± 143.07, 167.05 ± 170.04, 104.78 ± 63.95 and 169.16 ± 161.67 respectively.

Table 1

PE from each food group by age group and breastfeeding status Figure 1 (A, B) shows PE of all the amount of food group that are consumed by children in relation with age group. We cannot calculate the calories gain by breast milk because we don't have the quantity of breast milk. We only show the PE that is provided by liquids and other foods exclude breast milk.

PE gain by non-breast milk and infant formula in non-breastfed children is (76.64 in < 6 month, 18.11 in 6 – 11 months, and 6.84 in 12 – 23 month) which is more than those children who are breastfed. PE of breastfed children are 47.48, 18.26, 1.89 in children with age group < 6 month, 6 – 11 month and 12 – 23 months, respectively. PE from SSB and SFB is very less in all three age groups which is near to 0 but too little PE from SSB and SFB is attain by 12 – 23 month age group.



DISCUSSION

Initiation of breast milk in early life period that is from birth to 6 months of age was 65%. WHO suggests that breastfeeding should be started ideally in an hour after birth[16, 17]. Early initiation rates increase from 25.8% in 1990-91 to 65.5% in 2006-07[18]. In children < 6 months of age about 123% of energy comes from consumption of food other than breast milk that is from infant formula. Continued breast feeding up to two years is 15.7%. As we have a look on a survey done by National Institute of Population studies (NIPS) in 2006-07, the continued breastfeeding rates were high 54.9%[18]. The rates of breast feeding is decreased with the passage of time. There are many contributing factors to stop the breastfeeding but the main factor is early introduction of complementary feeding.

Breastfeeding

Exclusive breastfeeding should be continued for 6 months[14]. WHO also promoting proper feeding for infants and young children([19]). Another study believes on extensive degree to enhance breastfeeding in Pakistan[1]. Our data < 6 months of age were consuming mostly mother milk and introduction to cereals, fruits and vegetables were less. The relocating of breast milk is mainly associated to the introduction of solid foods. By the introduction of solid food in children < 6 months of age, the valuable nutrients from the milk are less available to the child. Solid food may have pathogen in them as they are located in the open environment where microbes are in larger amount and children are having less immunity so they are on greater chances to have disease. Breast milk is free from all type of pathogens

and in earliest stages; no blessing is more valuable than breastfeeding[1].

Complementary feeding

Results are compared with previous studies which are also showing lesser consumption of nutrient and mineral rich foods like (fortified foods, cereals, legumes, protein-based products) and higher consumption of energy dense foods like (maize based cereals and sweetened sugar beverages). A study conducted by India reveals that complementary feeding mainly based on cereals which is nutrient and mineral rich like millet preparations, biscuits and grain porridges and like those other foods prepared in semi-solid form[20]. Early initiation of the solid foods in age less than 6 months will lead to the increased no. of obese children in later age like in adolescent. Same results also found in previous studies, the rates of obese children are low among those who started complementary feeding later than 6 months and also increase the risk of adolescent obesity[21-23]. It is recommended by WHO that complementary feeding should contain varied variety of foods like protein rich foods, animal based products (fish, chicken and eggs) varied variety of vegetables and fruits that are rich in vitamin A but should be consumed only by children of age >6 months of age[24].

Vitamins and minerals rich & fortified foods should also be added in daily food consumption that will eradicate the deficiencies of certain vitamins & minerals. Results shows the intake of fruits and vegetables is 13.1% in children less than 2 years of age, primary and leading cause of vitamins deficiency. In Asian school going children, the major problem is macro and micronutrient deficiencies among children <5 years of age the rates calculated according to that study are 16% in china and 64 % in Bangladesh[25]. Similar results also found in this survey[26]. The salty snacks and desserts are 5 % consumed by the children which is an indicator of the overweight and obesity in children which should not be included in the diet of the children lesser than 2 years of age. According to the study performed on the risk of childhood obesity it is clearly defined that the foods rich in energy and protein if consumed by children of two years leads to greater risk of higher BMI and body fat[27].

By increasing the urbanization trends, people with rural background are moving toward urban areas. As mothers of urban areas are being mostly working women's so the trend of breastfeeding is low in this part as compared to rural areas where children are mostly breast fed or they consume buffalo or cow's milk. Infant formula is mostly consumed by urban children's. In our results consumption of cereal based products was high in urban children and moderate consumption of sweetened cereals, meat and mix food was also observed in urban children due to low SES. In rural children same ratio of consumption of mixed food and cereal base food was observed. According to a previous study conducted consumption of lentils, tea and vegetable diminishes with time and consumption of frozen desserts, chicken, cake and vegetable oil increases with time in urban population[28].

To minimize the errors, we used home utensils to estimate the quantity & serving portion of the food consumed by the participant and also the food left by the children routinely but still these limitations could not have the significant effect on our results.

But there are the strengths of our study because it is focusing on shorter but critical period of life of the children contributing lifelong effects on the life of a child including physiology, disease, functions and health of children under 24 months. The results of this study states the present status of children related to diet & can be helpful for making policies & plans on national level for improving the dietary practices of population.

It is concluded that, children of Pakistan are not taking adequate food according to their age that results malnutrition in various aspects under 2 years of age. More than half are taking infant formula among children < 6 months of age while according to recommendation by WHO children under 6 months of age should be exclusively breast[17].

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared

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