

## Research

# Lack of adherence to complementary feeding in middle socioeconomic status Pakistani infants and young children

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## PURPOSE

Nine- and one-half percent of Pakistani children under five years of age are overweight, compared to the worldwide estimate of 5.6%. To help prevent under and over nutrition WHO recommends assessing infant and young child feeding practices for targeted interventions. The objective of our study was to compare the dietary practices of metro and non-metro, middle socioeconomic class Pakistani children to WHO guidelines.

## METHODS

Trained female interviewers went door to door in arbitrarily selected middle-class neighborhoods of 7 cities and if children aged 6-23 months resided in the household, their mothers were asked to answer a questionnaire about their children's initial and complementary feeding practices and specifically, their intake in the previous 24 hours. Results of the survey were compared to WHO recommendations.

## RESULTS

The questionnaire was completed by 192 mothers. Results indicated that 27% of sample children had already received some food apart from any milk before age 6 months; for 6% this had occurred before the age of 3 months. In the 7-12-month-old group, 11% had not yet received any complementary foods while this was the case for 6% of those aged 13-23-months. Only 49% of the 12-17-month-old and 60% of the 18-23 achieved minimum dietary diversity. Of the 13-23-month-olds, 80% routinely received sucrose-added foods and 71%, soft drinks.

## CONCLUSIONS

Major deviations from WHO recommendations were observed. These included inadequate food diversity, early and late introduction of complementary feedings, and routine feeding of sweetened foods and beverages. These findings should be taken into consideration when implementing educational measures for infant and young child feeding.

## BACKGROUND

Protective, modifiable factors that could be associated with healthy growth and development during the first 1000 days include maternal diet, duration of exclusive breastfeeding, and timing, quality, quantity, and variety of complementary feeding (CF) (Schwarzenberg and Georgieff 2018). Many studies have shown the correlation between nutrition in the

first 1000 days and the later development of obesity and non-communicable diseases (Hanson et al. 2016).

Exclusive breastfeeding means that the infant receives only breast milk (from his or her mother or a wet nurse or expressed breast milk) and no other liquids or complementary foods except for undiluted drops or syrups consisting of vitamin and mineral supplements or medicines ("Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods" n.d.). CF is

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defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk (“Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods” n.d.). By extension, the definition of CF is also applied to non-breastfed infants. The WHO recommendation is that solid, semisolid, or soft foods should be introduced at six months of age. Infants and children need to receive an acceptable diet with a minimum meal frequency that provides dietary diversity (DD) in addition to iron-rich foods (“Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods” n.d.). The incidence of malnutrition is highest amongst young children aged 6–18 months in most developing countries, and it is difficult to compensate for this later in childhood (“Levels and Trends in Child Malnutrition UNICEF / WHO / World Bank Group Joint Child Malnutrition Estimates Key Findings of the 2019 Edition” n.d.). CF are often of inadequate nutritional quality, or they are given too early or too late, in too small amounts, or not frequently enough (*Infant and Young Child Feeding: Model Chapter for Textbooks for Medical Students and Allied Health Professionals* 2009).

The WHO has recognized the need to assess infant and young child feeding (YCF) practices for targeted interventions to at-risk populations and to monitor and evaluate progress with feeding practices after the start of interventions. In addition to indicators that measure breastfeeding practices, WHO has introduced CF indicators to assess feeding practices in children 6–23 months (WHO 2021) (“Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods” n.d.) such as minimum DD of at least five food groups per day (“Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods” n.d.) and minimum acceptable diet (MAD), an indicator for evaluating child feeding practices which is the result of a combination of the minimum DD and minimum meal frequency (MMF) (WHO, UNICEF, and USAID 2008). Recommended MMF is twice a day for breastfed infants aged 6–8 months, three times for breastfed children aged 9–23 months and four times for non-breastfed children aged 6–23 months (WHO, UNICEF, and USAID 2008).

Pakistan, a lower-middle-income country, has the world’s fifth-largest population (“Countries in the World by Population” 2022) and a birth cohort of approximately 6 million. Malnutrition is a predominant public health challenge (Tanweer, Zaman, Fatima, et al. 2015). Although almost one-fourth of the Pakistan population cannot meet nutritional requirements, the prevalence of overweight and obesity is 25%. The prevalence of obesity is 10.3%, while 9.5 % of children below the age of 5 are overweight (Jafar, Chaturvedi, and Pappas 2006) compared to the worldwide estimate of 5.6%. In addition to genetics, socioeconomic factors, family history, psychological factors, and lifestyle, it has been shown that children with CF introduction before 4 months had higher odds of being overweight during childhood than children with CF introduction at or after 4 months (Pluymen et al. 2018), an association that was observed both in formula- and breastfed infants.

It has also been described that a high intake of added sugars in individuals below age 2 associates with rapid weight gain, though breastfeeding  $\geq 12$  months appears protective against this (Kong et al. 2021). A study from the US found that markers of lower socioeconomic status were strongly associated with earlier juice introduction, which, in turn, relates to sugary beverage intake in childhood, potentially replacing water (Robinson et al. 2021). There is then a cumulative disastrous effect of obesity continuing in school-aged children (Warraich et al. 2009) and adults, even medical students (Khan et al. 2016).

Micronutrient deficiencies have also been found to be prevalent among all socioeconomic classes, with lower socioeconomic classes being most severely affected. Pakistan is facing this dual burden of malnutrition. Evidently, there is a need to identify not only the risk factors that directly contribute to nutrition gaps but also at what time they occur in order to implement timely interventions.

The MAD, along with the other seven YCF indicators, was developed for assessment at the population level in order to make comparisons across and within countries, to describe trends over time, to target/identify populations at risk, target interventions, make policy decisions about resource allocation, and serve as an impact measure when monitoring and evaluating YCF programs (“Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods” n.d.). Because the MAD indicator captures multiple dimensions of feeding, it can be used for comparisons across populations with different rates of continued breastfeeding or be presented by breastfed and non-breastfed children.

Studies of malnutrition in Pakistan are usually carried out in underserved populations. We were interested in determining if early feeding practices and dietary habits in a middle-class population meet WHO guidelines and whether we could identify any early deviations that may predispose children to become overweight or obese later in life. For this purpose, in June 2019, the authors commissioned a specialized agency (Kantar, Pakistan) (the Agency) to carry out a survey to assess the nutritional practices of infants and toddlers (referred as “children” in the rest of this paper).

## MATERIAL AND METHODS

One of the investigators (HF) developed a detailed questionnaire which included a 24-hour dietary recall in Urdu using as the WHO guidelines for CF (“World Health Organization: Complementary Feeding” n.d.). The questionnaire included demographic information as well as diet and feeding-related behaviors based on published modifiable factors associated with healthy growth in infants and young children. The questionnaire was internally validated by the Agency among women of similar socioeconomic background.

Trained female interviewers went door to door in arbitrarily selected homes of middle-class neighborhoods in Karachi, Lahore, Islamabad and Rawalpindi (metro cities, for Pakistan: population over 500,000), Hyderabad, Multan and Faisalabad (large, non-metro cities) and inquired if there were children of the target age (6–23 months) in the household in which case they invited the mother to partic-

ipate. Mothers who agreed to participate, signed a written informed consent. The family name of the participants was not recorded. The final portion captured the actual dietary behavior of the sample children via recalling and recording the food items the children had consumed the day prior to the interview. This was recorded in open-ended fields. Results were compared to WHO recommendations for MAD, MMF, and MDD.

The study was approved by the Ethical Review Committee of the Rawalpindi Medical University and Allied Hospitals on March 30, 2019.

## DATA ANALYSES

A statistician at the Agency transformed the answers to the form required to perform MDD and nutritional gap analysis. The comprehensive list of food items consumed by the subjects was extracted from the survey and required food groupings were provided by the authors and further streamlined by the Agency. The food items volunteered by mothers were categorized into food groups to form desired and recommended variables to assess the IYCF indicators elaborated by WHO ("Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods" n.d.).

Simple distribution and cross tabulations were performed and for the measures of central tendencies mean measures were computed. The sample of 192 children was divided into the following subgroups: 6-11, 12-17, 18-23 months. Testing for statistically significant differences between these age groups was performed wherever it seemed meaningful and the sample size achieved for food group analysis was large enough to see the results across these groups within acceptable error margins. We indicate as significant values that are significantly different from counterpart age groups at a 95% confidence level.

## RESULTS

Out of a total sample of 314 children aged 6-23 months, 192 (61.2%) of their mothers volunteered to provide the dietary consumption data of their referent child. The main reason given by those who did not agree to participate was the length of the survey. 73% of those who completed the survey had a metro residence. All women were married, none widowed or divorced. Only 3% worked outside their homes. Fifty seven percent of the children were male and only 3% of mothers had more than one child. The average (range) monthly family income converted to US dollars was 150 (130-1280) monthly family income in US dollars. Other characteristics of the participating women are presented in [Table 1](#).

## INTRODUCTION OF COMPLEMENTARY FEEDINGS

Twenty seven percent of the sample had already received food other than milk by 6-months of age; 6% had received it while they were under the age of 3 months. Eleven percent of the 7-12-month-olds and 6% of the 13-23-month-olds still had not received any solid foods. Of the entire sample, most of them had received cereal (81%) and commercial

biscuits (69%) in the day prior to the interview. Other frequently mentioned foodstuffs were banana (33%), potatoes and eggs (25% each) ([Table 2](#)).

## INDICATORS RELATED TO INFANT AND YOUNG CHILDREN FEEDING PRACTICES (IYCF)

Approximately 41% of the children achieved minimum dietary diversity (MDD) with an average consumption of 3.2 food groups on the day preceding the interview, 23% in the 6-11-month-old group, 49% in the 12 to 17 and 60% in the 18 to 23 age group. MDD-IYCF practices were driven by food groups comprised of grains, roots & tubers (89%) and dairy products other than breast milk (82%), followed by fruits & vegetables, eggs (36%) and legumes and nuts (28%); 75% of the 6-23-month-old were Minimum Meal Frequency (MMF) compliant, observed more prevalently in boys. Slightly over one-fourth of the children were receiving Minimum Acceptable Diet (MAD) and MAD compliance was high in toddlers of age 18-23 months (39%) and particularly in the metro population. Approximately 60% of the population studied had received some form of iron-rich/fortified food on the day prior to the interview. Close to 36% of the children received only one, 42% received 2, 17% received all three while 5% did not receive any nutrient rich food category during the previous day; 80% of the children consumed animal source foods and 55% fruits & vegetables, while few consumed legumes and nuts (28%) ([Table 3](#)).

Adult table food predominated at 13-23 months, mainly in the form of bread, meat, eggs, and sweet foods. Sugary and fatty foods were consumed from a young age.

After the age of 7 months of age, disruption from recommended CF practices became more obvious: approximately one half of the children were reported to consume sucrose added foods such as candy, cookies, cake, ice cream (60% among 7-12-month-old, and 80% among the older children). In addition, sweet drinks such as juice drinks, soft drinks, soda, sweet tea, etc. was consumed by 52% of 7-12-month-old and 71% among the 13- to 23-month-old, with a frequency of 5-6 times a week for both age groups.

## FACTORS ASSOCIATED TO AN INADEQUATE DIETARY DIVERSITY

The adjusted rates of not meeting minimum DD were higher among children whose mothers were currently breastfeeding another child (AOR = 1.36). A declining trend in the risk of inappropriate minimum DD was observed with increasing age of the child. Compared to mothers with secondary or higher level of education, no education (AOR = 1.70) carried a significant risk factor for inadequate DD. Mothers who did not read the newspaper almost daily (AOR = 1.75), did not listen frequently to the radio (AOR = 1.29), or did not routinely watch television (AOR = 1.27), reported a higher risk for poor DD. The lowest income earning quintile (AOR = 1.84) was a significant risk factor for inadequate DD as compared with the highest income quintile. Of the health care attributes, there was an association between inappropriate DD and fewer antenatal clinic visits (AOR for none = 1.92; one to two visits = 1.76; three to six visits = 1.52) and no postnatal check-ups (AOR = 1.25).

**Table 1. Demographic characteristics of participating women**

|           |  |    |
|-----------|--|----|
| Age       | 20 – 24  | 26 |
|           | 25 – 29  | 36 |
|           | 30 – 34  | 25 |
|           | 35 – 40  | 13 |
| Education | Illiterate   | 2  |
|           | Less than Primary (Less than 5 years of schooling) | 3  |
|           | Between primary and Metric (School 5-9 years)      | 12 |
|           | Metric (10 years of schooling)                     | 37 |
|           | Intermediate (12 years of education)               | 18 |
|           | Graduate (14 years of education)                   | 19 |
|           | Post-graduate (16 years of education)              | 8  |
| Residence | Karachi  | 19 |
|           | Lahore   | 20 |
|           | Islamabad/Rawalpindi                               | 20 |
|           | Faisalabad   | 15 |
|           | Multan   | 13 |
|           | Hyderabad  | 13 |

**Table 2. Food consumption in past 24 hours, by age group. Combined breastfed and formula fed.**

| Age in months                            | 0-6 |         | 7-12 |         | 13-23 |         |
|--|-----|---------|------|---------|-------|---------|
| Food item                                | %   | Average | %    | Average | %     | Average |
| Dairy foods                              | 14  | 8.2     | 60   | 8.5     | 66    | 8.4     |
| Soy foods                                | 2   | 7       | 8    | 5.1     | 10    | 4.9     |
| 100% fruit juice (no sugar added)        | 17  | 5.6     | 5.3  | 6.6     | 6.6   | 5.2     |
| 100% vegetable juice                     | 2   | 5       | 10   | 5       | 6     | 5.4     |
| Fruit                                    | 25  | 6.5     | 86   | 6.8     | 95    | 8.4     |
| Vegetables                               | 7   | 4.2     | 44   | 4.2     | 54    | 4.6     |
| Fried potatoes                           | 10  | 4.9     | 64   | 4.3     | 79    | 4.3     |
| Other potatoes                           | 14  | 4.1     | 63   | 3.6     | 61    | 4.4     |
| Baby cereals                             | 22  | 2.1     | 67   | 9.5     | 48    | 9.7     |
| Breads, crackers tortillas, pasta, rice, | 14  | 6.1     | 53   | 6.4     | 74    | 6.6     |
| Beef or chicken                          | 9   | 4.1     | 56   | 3.7     | 69    | 3.6     |
| Fish or shellfish                        | 1   | 7       | 5    | 5.3     | 5     | 2.4     |
| Eggs                                     | 14  | 4.3     | 66   | 4.6     | 72    | 4.4     |
| Added sugar drinks                       | 13  | 7.3     | 52   | 5.6     | 71    | 6.6     |
| Foods with added sugar                   | 11  | 5.7     | 60   | 5       | 80    | 6.6     |

Three-fourth (74%) of the sample were MMF compliant and this was consistent across age groups, residence (metros vs. non-metros) and breastfed and non-breastfed as well. However, MMF compliance was significantly higher in boys (45%) than girls ( $p < 0.05$ ).

## DISCUSSION

Our survey concentrated on a select part of the Pakistan population and consisted of a relatively small sample. However, this group in Pakistan is rarely the object of any nutritional assessment. As the measures of our study were de-

rived from open-ended data (instead of a structured set of questions as it was in the WHO document), results of this study should be read with certain qualifications, keeping in mind the difference of data collection methods in consideration. In addition, we did not follow these children over time, thus our conclusions are a generalized association rather a definite connection. Despite the limitations of our study, we identified several factors, early in life, that may precede overweight early and delayed introduction of CF, low food diversity and early introduction of inappropriately sweetened beverages and food. Except for the percentage of infants initiating CF at 6-8 months of age, where our values and those of the most recent Pakistan Demographic

**Table 3. Percentage of children who consumed nutrient-rich food categories the day prior to the interview**

| Age in months                        | 6-11 | 12-17 | 18-23 |
|--------------------------------------|------|-------|-------|
| Number of children surveyed          | 83   | 67    | 42    |
| <b>CONSUMED ONLY ONE NR CATEGORY</b> | 50*  | 30    | 23    |
| Animal source food                   | 39   | 28    | 21    |
| Legumes and nuts                     | 1.2  | 0     | 0     |
| Vegetables/Fruits                    | 10*  | 2     | 2     |
| <b>CONSUMED TWO NR CATEGORIES</b>    | 28   | 51*   | 52*   |
| ASF + LN but no VF                   | 7    | 15    | 6     |
| ASF + VF but no LN                   | 20   | 36*   | 44*   |
| LN+VF but no ASF                     | 1    | 0     | 2     |
| <b>CONSUMED ALL 3 CATEGORIES</b>     | 10   | 19*   | 25*   |
| <b>CONSUMED NONE OF 3 CATEGORIES</b> | 12   | 0     | 0     |

NR: nutrient-rich ASF: animal food source; LN: Legumes and nuts; VF: vegetables and fruits\*Significantly different than at least one other age group at 95% confidence level

and Health Survey from 2017-18 (PDHS) (“Pakistan Demographic and Health Survey 2017-18” n.d.) are similar (75% and 65%, respectively), the rest of our dietary parameters differ substantially between both, probably attributable to the populations sampled, ours being predominantly middle class. Our findings of too early and late introduction of CF have potential long-term nutritional implications (Fewtrell, Bronsky, Campoy, et al. 2017).

Analyses have shown that the MAD indicator is associated with child anthropometric status, particularly stunting (Jones et al. 2014). The association between DD and the nutritional status of children has already been studied in various countries (Arimond and Ruel 2004; Ahmad et al. 2018). A study from India (Agrawal et al. 2019) indicated that lower income level is associated with low food diversity. In our study, however, low food diversity was found in a group that is not of low income. One of the confusing factors perhaps contributing to low diversity is that many mothers consider potatoes as vegetables which in Pakistan are given in different forms.

Whereas WHO recommends delaying the initiation of complementary feeding until 6 months of age (180 days), the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) recommendations state that CF should not be introduced before 4 months but should not be delayed beyond 6 months (Fewtrell, Bronsky, Campoy, et al. 2017). Infants should be offered foods with a variety of flavors and textures including slightly bitter tasting green vegetables. Continued breast-feeding is recommended alongside CF. All infants should receive iron-rich CF including meat products and/or iron-fortified foods. As recommended by WHO, no or a very small quantity of sugar and salt should be added to CF and fruit juices and sugar-sweetened beverages should be avoided (Fewtrell, Bronsky, Campoy, et al. 2017).

Perhaps the most important and concerning findings of our survey were the early introduction, frequency, and quantity of providing inappropriate foodstuffs and many with added sucrose, beyond recommendations and those containing trans fats, in the form of commercial biscuits. The taste system has a certain plasticity and because of

which, preferences for sweetened beverages and foods are rapidly acquired when there is early exposure to the sweet taste. Longitudinal studies have demonstrated that newborn infants routinely fed sugar water, by 2 years of age would prefer significantly higher concentrations of sucrose solutions in contrast to children who had no such experience (Beauchamp and Moran 1984). Consumption of sweetened beverages (SB) has been associated with later risk of obesity, but little evidence exists to evaluate if age of introduction and cumulative SB consumption increases risk in children (Keller and Bucher Della Torre 2015). Cantoral et al. (Cantoral et al. 2016), in a cohort of 227 Mexican children, found that high SB consumption increased the likelihood of obesity in 8–14-year-old children and suggested that SB intake should be delayed and excessive SB consumption in pre-school period should be avoided (Arimond and Ruel 2004). It is well recognized that SB do not offer any nutritional benefit. The literature contains reports that high intake of SB during childhood is linked to negative health outcomes including weight gain (Ludwig, Peterson, and Gortmaker 2001), greater waist circumference and dental caries (Palacios, Joshipura, and Willett 2009). The risk of excessive weight gain can be secondary to the fact that liquid calories do not have a concomitant satiety response and, therefore, the individual fails to compensate for excessive intake of calories (Mattes 1996; Popkin 2010). Similar findings were reported in a paper from South China (He et al. 2018). A 2015 systematic review of papers related to SB consumption identified a total of 46,876 publications (Mazarello Paes et al. 2015). Twelve correlates/determinants were associated with higher SB consumption: child’s preference for SB, TV viewing/screen time and snack consumption; parents’ lower socioeconomic status, lower age, formula milk feeding, early introduction of solids, using food as rewards, parental-perceived barriers, attending out-of-home care, and living near a fast food/convenience store. Ingestion of certain fruit juices has been seen to increase intestinal gas production (Lifschitz 2000) and cause failure to thrive (Smith and Lifshitz 1994). Sobek et al. found that there were twice as many obese children in a group that preferred the high-sweet taste compared to the group that pre-

ferred the low-sweet taste (Sobek et al. 2020). In their position paper, ESPGHAN mentions that observational studies show that SB intake during infancy and early childhood is associated with SB intake in childhood and adolescence (Fidler Mis et al. 2017). Intake of free sugars should be reduced and minimized with a desirable goal of <5% energy intake in children and adolescents aged 2-18 years. Intake should probably be even lower in infants and children under the age of 2 years (Bauer and Waldrop 2009).

In addition to the ones mentioned above, our study has additional limitations. Many women did not agree to participate because of the length of the survey. In addition, the number sampled is relatively small. The strength of our study, however, is that it provides CF data from a middle-class Pakistani society, a population rarely addressed.

We hope that this information may be helpful to implement measures to correct these feeding practices. Awareness efforts need to take these findings into consideration to implement necessary educational measures to health care professionals starting at birth and repeating as early as CF are introduced.

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#### ABBREVIATIONS

WHO: World Health Organization

DD: dietary diversity

MDD: minimum dietary diversity

IYCF: infant and young children feeding practices

MAD: Minimum Acceptable Diet

SB: sweetened beverages

ASF: animal source food

LN: Legumes and nuts

VF: vegetables and fruits

CF: complementary feeding/foods

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