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Effect of Local Complementary Food Mixes on the Weight of Malnourished Children in Peshawar, Pakistan

Zia-ud-Din[1, *], Muhammad Abbas[1], Saleem Khan[1], Zafar Iqbal[2], Mudassar Iqbal[2], Muhammad Hussain[1], Zahoor Ahmad[1]

[1]Department of Human Nutrition, the University of Agriculture, Peshawar, Pakistan
[2]Department of Agricultural Chemistry, the University of Agriculture, Peshawar, Pakistan

Abstract

Complementary biscuits were prepared from wheat and rice in the Department of Human Nutrition laboratory KPK, Agricultural University, Peshawar. Interventions of these biscuits were performed among malnourished children (< 2 years; weight-for age z-score below the 5th centile of WHO standards). Malnourished children were selected from the pediatric ward of Hayatabad Medical complex (HMC) Peshawar. Total of 160 malnourished children were selected. These children were divided into 4 groups; each group included 40 malnourished children. Group 1, 2 and 3 received wheat, rice and commercial cerelac product respectively, while group 4 was control. Weights of all groups were taken using standardized methods before and during intervention at 15, 30, 45 and 60 days. Before intervention the weight for age z-score of wheat, rice, cerelac and control groups were -1.89, -1.98, -1.94 and -1.95 respectively while after intervention, weight for age Z-score was -1.22, -1.48, -1.39 and -1.53, respectively. The results revealed that on average, wheat group showed growth performance better than other groups after intervention.

Keywords

Complementary Foods, Weight Gain, Malnourished Children

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1. Introduction

Malnutrition is a major problem amongst children in developing countries; it is therefore highly recommended to improve strategies and policies for complementary feeding for infants in this part of the world (Weaver et al, 1995). In the second half of first year of life, human milk does not provide enough energy and nutrients to meet nutritional requirements of the infants, so they are at high risk for malnutrition if appropriate complementary foods are not introduced in the right time (Rowland et al, 1978, Toriola, 1990, Wright et al, 2004, Adekunle, 2005). Inappropriate feeding practices are thus major contributing factor to the high morbidity among infants and young children in developing countries (WHO, 2000, Nita et al, 2004).

The cereals as wheat, maize and rice, and pulses are the major food ingredients of significant importance of our population. These food ingredients are rich sources for energy, micronutrients especially minerals and medium quality protein; therefore they should be formulated to prepare easily available and inexpensive complementary food for the children in low socio economic community to prevent the long standing problem of malnutrition among infant in their early stage of growth and development. Several commercial complementary mixes are being marketed in Pakistan, but they are too expensive and mostly out of the

* Corresponding author
E-mail address: ziaud.din@aup.edu.pk (Zia-ud-Din), mabbas_11@yahoo.com (M. Abbas), saleem_khan288@yahoo.com (S. Khan), zafar.iqbal@aup.edu.pk (Z. Iqbal), mudassariqbal@aup.edu.pk (M. Iqbal), toreghar@yahoo.com (M. Hussain), z_ahmad444@yahoo.com (Z. Ahmad)

reach of people from low socioeconomic background. It is therefore imperative to formulate inexpensive complementary mixes from locally available resources that can easily be prepared at home.

The current study was design with the aim of investigating the effect of complementary practices (prepared from wheat and rice) on the growth of malnourished children.

2. Materials and Methods

2.1. Location of the Study

The study was conducted (March 2011 to December 2012) in Nutrition Rehabilitation Unit (NRU), at Pediatric wards of two major hospitals of Peshawar, Pakistan.

2.2. Sample Selection and Sample Size

Children were the subjects of the study (age 12-24 month). Malnourished children (weight-for-age z-score, WAZ < 5th centile of WHO 2006 growth standards) (WHO 2006), admitted in the 'Nutritional Rehabilitation units' were receiving the routinely nutritional supplements and multivitamins. Ethical approval to conduct the study was obtained from the Board of Advanced Study and Research, University of Agriculture, Peshawar. The importance of intervention was fully explained to the parents and after getting their consent, children were enrolled for the study. A total of 260 children of both sexes were selected randomly. Children were divided into four groups based on feeding type for intervention i.e. wheat, rice, commercially available product and control.

2.3. Preparation of the Biscuits

Two cereal-based biscuits were prepared from locally available cereals (wheat and rice) mixed with maize, grams (channa) and peanuts. Beside these ingredients, sugar, fat and anise seeds were also used. For making biscuits from local ingredients, cereals were properly cleaned from impurities and then were properly washed to remove the dust particles. After washing, cereals were dried in sun heat and then were toasted for 4 to 5 minutes till the colour of the grains changed to bright yellow. These toasted cereals were grinded in an electric grinder to get the fine powder and then each ingredient was accurately weighed and mixed. Biscuits were prepared in a local bakery in the presence of research team. For the preparation of biscuits, 70 g of ghee and 30 g of sugar were used per 100 g of powder sample (55g wheat, 15 g maize, 20 g grams, 8 g peanuts and 2 g anise seed).

2.4. Data on Feeding Practices

The complementary biscuits were given to children for a period of two months. A questionnaire was prepared for parents to ask questions about child feeding practices. Anthropometric measurements of malnourished children were taken before starting the complementary food and reassessed after 15, 30, 45 and 60 days by following the procedure recommended by World Health organization (WHO, 1985). These measurements were recorded on a questionnaire. Weight values of the children were compared with World Health Organization (WHO, 2006) standards to generate z-scores. Each child was provided with 1 kg of the biscuits for 15 days. Parents were properly guided how to feed the biscuits to their babies. The researchers confirmed the consumption of the biscuits by asking children's parents frequently about the amount being consumed.

2.5. Statistical Analysis

The data were entered and analyzed in SPSS (SPSS Inc. 2007). As our factor variable, the 'intervention group' had 4 levels (wheat, rice, commercial formula and control), contrasts were used to test for differences among the levels and the linearity trend. Once it was determined that differences among the levels of a factor existed, post hoc range tests were performed to determine which means differed (Dunnett 1980). The Tukey's Honest Significant Difference (HSD) multiple comparisons test was selected to identify the factor levels whose means were statistically different.

3. Results & Discussion

Table 1 reveals results on WAZ of the feeding groups at baseline and at 15, 30, 45 and 60 days after intervention. At 15 day, no important effect of intervention on the children weight was evident ($p>0.05$), however by day 30, difference in WAZ of wheat and control group was found ($p<0.05$) and children from wheat group were heavier than control but not from other groups. By day 45, children from wheat group were heavier than all other groups and remained heavier at 60 days ($p<0.05$). Children from rice group were heavier than other group next to wheat group. Our findings have shown that wheat based intervention had markedly effect on weight of the children followed by rice group and 'commercial formula' group. These findings are in fair agreement with Nazni et al. (2010) who reported prominent effect of wheat based weaning biscuits on children weight after 3 months of feeding. Similarly, our findings are also in line with those of Greco et al. (2006) who found low cost porridge highly effective in treating malnourished children; Greco et al. (2006) has shown increase in weight gain by 50% in malnourished children after intervention.

Table 2 shows the result regarding the weight-for-height z-

score (WHZ) of malnourished children by feeding group. The results show that the mean WHZ of wheat, rice, commercial formula and control groups (-1.47, -1.66, -1.64, -1.67 respectively) were not significant ($p>0.05$) at 15 day of intervention; however differences in means existed at 30, 45 and 60 days ($p<0.05$). Children in the wheat group had higher WHZ than others. These findings are in fair agreement with Nazni et al. (2010) who reported prominent effect of wheat based weaning biscuits on children height after 3 months of intervention.

The research study had certain strengths. The cohort under the study was sufficiently large to determine differences in the outcome variables of intervention. The intervention materials were prepared from locally available cheap sources without needing a large economic investment. One major limitation of the study may be that intervention materials can only be prepared by well-professional personals with sufficient background knowledge of health and nutrition.

4. Conclusion and Recommendations

Weight measurement of wheat, rice, cerelac and control groups concluded that wheat biscuits showed better improvements in weight gain. It is recommended that cereal like wheat, maize, rice and pulses should be formulated to prepare easily available and inexpensive complementary foods for the children in low socio economic community to prevent the long standing problems of malnutrition among children in their early stage of growth and development.

Table 1. Weight-for-Age z-score of malnourished children by feeding groups.

Groups	N	Weight-for-Age SDS (WAZ) Mean(95%CI)[1]				
		Baseline	15 days	30 days	45 days	60 days
Wheat	65	-1.89 (-1.99;-1.78)	-1.73 (-1.83;-1.63)	-1.54^{a} (-1.63;-1.44)	-1.33^{bcd} (-1.43;-1.24)	-1.22^{ef} (-1.31;-1.11)
Rice	65	-1.98 (-2.11;-1.84)	-1.79 (-1.92;-1.66)	-1.68 (-1.82;-1.54)	-1.57^{b} (-1.70;-1.43)	-1.48^{e} (-1.62;-1.34)
Commercial formula	65	-1.94 (-2.03;-1.84)	-1.79 (-1.89;-1.68)	-1.65 (-1.79;-1.50)	-1.52^{c} (-1.68;-1.37)	-1.39 (-1.56;-1.23)
Control	65	-1.95 (-2.06;-1.83)	-1.87 (-1.99;-1.74)	-1.76^{a} (-1.89;-1.63)	-1.63^{d} (-1.78;-1.49)	-1.53^{f} (-1.70;-1.37)
Total	260	-1.94 (-1.99;-1.88)	-1.79 (-1.85;-1.74)	-1.66 (-1.77;-1.66)	-1.52 (-1.58;-1.45)	-1.40 (-1.48;-1.33)

[1]Means of groups with the same letters are different from each other

Table 2. Weight-for-Height SDS of malnourished children by feeding group.

Groups	N	Weight-for-Height SDS(WHZ) Mean(95%CI)[1]				
		Baseline	15 days	30 days	45 days	60 days
Wheat	65	-1.57^{a} (-1.99;-1.78)	-1.47 (-1.61;-1.33)	-1.30^{abc} (-1.43;-1.18)	-1.13^{def} (-1.24;-1.01)	-1.05^{ghi} (-1.19;-0.92)
Rice	65	-1.79^{a} (-2.03;-1.56)	-1.66 (-1.89;-1.42)	-1.61^{a} (-1.85;-1.36)	-1.56^{d} (-1.81;-1.30)	-1.53^{g} (-1.77;-1.28)
Commercial formula	65	-1.72 (-1.83;-1.60)	-1.64 (-1.76;-1.51)	-1.56^{b} (-1.74;-1.38)	-1.49^{e} (-1.68;-1.30)	-1.41^{h} (-1.62;-1.20)
Control	65	-1.67 (-1.76;-1.57)	-1.67 (-1.79;-1.53)	-1.63^{c} (-1.75;-1.50)	-1.57^{f} (-1.72;-1.42)	-1.54^{i} (-1.72;-1.36)
Total	260	-1.68 (-1.76;-1.61)	-1.61 (-1.69;-1.53)	-1.53 (-1.61;-1.44)	-1.44 (-1.53;-1.34)	-1.38 (-1.49;-1.28)

[1]Means of groups with the same letters are different from each other

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