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Efficiency of high protein biscuit in the treatment of undernutrition

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Abstract
The aim of the present study is to determine the efficiency of high Protein biscuit (HPB) in the treatment of under-fives with moderate Undernutrition (-2SD), through its optimal use and health education for mothers. To achieve the above aim a randomized controlled trial study design was adopted, and Al-Sharki Primary Health Care Centre (PHCC) and its community child care units (CCCUS) were chosen as a study setting. Fifty undernourished children under-fives (-2SD) were chosen group (A) as a case and another 50 also undernourished (-2SD) were chosen as a control group (B). A program of supervised feeding of children in group (A) was designed and implemented. The control group (group B) received the (HPB) from the (CCCUS) according to the regulation of the Ministry of Health. The study took a period of six months (31/12/2000 - 30/6/2001). Evaluation was done at the end of June 2001. A significant decrease the incidence of acute respiratory infection and acute diarrhea in both study groups were noticed. However, it was higher in group (A) than in group (B). More significant improvement in mother's knowledge about (HPB) was recorded in group (A). Regarding the nutritional status only (10%) of group (A) children their weight for age was not improved compared to (34%) of group (B) children. While by using weight for height only (2%) of group (A) children were not improved. Reduction in the prevalence of anemia was also more in group (A) than in group (B).
optimal use of HPB and health education for mothers remains an excellent tool in the treatment of children with moderate undernutrition (-2SD).

Keywords: children, weight, height

Introduction
Food is the blessing of nature that almighty God wanted for human to perpetuate his life and preserve his body's elements strong and able to survive. The Almighty wanted for his wisdom to start the life as a child in the bosom of a woman who defends him against the dangers of childhood and its health crises in order to grow up in a good physical and mental health and perform his job in life with success and superiority. The good food is the food that provides the child all the needs of different nutrients and is a balanced diet which contains a homogeneous amounts of food groups. There is no specific diet that contains all the elements needed by the body so in order to get all the nutrients the child will need to deal with different amounts of different types of food, and this is called a balanced food. Limiting food to one or two types of food for a long time causes a deficiency in of some basic nutrients elements and may lead to undernutrition (the Child Welfare Authority in Iraq and UNICEF 1993) [1]. Iraq has been suffering for more than ten years from the imposed economic blockade. Cases of undernourishment have spread sharply in society, and the proportion of micronutrient deficiencies has increased, and a high rate of protein and energy deficiency has appeared [2]. The nutrition project in Iraq, which is implemented by the Ministry of Health in cooperation with UNICEF and other organizations, uses a broad strategy to reach to improve the nutritional status of children under the age of five and includes three activities: the first preventive activity which includes awareness, community participation and participation on Delivering health concepts about nutrition and food for all segments of society. As for the second activity, it is a therapeutic activity, through which children with moderate undernutrition are treated. This means monitoring, examination and referral to primary health care centers (PHCC) for obtaining additional care and the distribution of complementary foods when available. The third activity includes ensuring complete improvement of severely undernourished children who are treated in nutritional rehabilitation centers (NRC) in hospitals and its rehabilitation activity. High protein biscuit, which is distributed by community centers (CC) to children with moderate undernutrition, is an important food, especially for children aged (6-24) months, and the child needs (2.5) kg / month, which is about 85 g / day. The high protein biscuits provide the child under the age of a year with about a half of his needs, so the child needs extra food with high protein biscuits. As for children between the ages of (2-5) years of age, this food provides them about (15-20%) of their needs, and they need additional nutritional elements that are provided from the regular food of the family [3]. The aim of this study is to demonstrate the effectiveness of high-protein biscuit in treating cases of undernutrition through the best use.

Study sample and work method
The Eastern (PHCC) was chosen for the purpose of conducting the study, as this center is located in the left part of the city of Mosul, and provides its services to a large and crowded residential area, and there are four (CC) affiliated to it that provide services to children under the age of five in the geographical areas that belong to it, and the work in this (CC) lasts two days in a week. Working hours range from two to four hours per day. These centers examine all of these children and refer those who are undernourished (-2 and -3 a standard deviation from the mediator) to (PHCC).

This study is a randomized controlled trial. The study community is among children who were under the age of five years who were attending the Maternal and Child care unit in the (PHCC) and those referred to it from (CC) in the geographical area of the health center with their mothers, where these children were examined and their nutritional status checked, the children without nutritional deficiency were excluded from the study, then one of three options was determined according to the child's nutritional status. The first option, which is the nutritional status (-3SD), these children were referred to nutritional rehabilitation centers (NRC). As for the second option, which is the nutritional status (-2SD), is the study sample, where referred to community center. The third option, which is the nutritional status (-1SD), where these children were referred to community center which needs only educating the mother and treated like normal children.

The study sample was chosen in a coordinated (systemic) way, as one of the two children was chosen from the second option for the nutritional status (-2 standard deviation from the mediator), and then the sample was also divided systematically into two groups (A, B) where each group included (50) children and The study program was applied to group (A), while group (B) was left to follow the system without interference, the mother was educated in (CC) and left the method of use to the mother, (Figure 1).

The information was collected by relying on a special questionnaire for children who were chosen with their mothers (the study sample and the control sample).

This questionnaire contained information on the child's sex and age, the type of breastfeeding, the date for the start of complementary foods for children under two years, the diseases that the child had been infected with in the previous month and during the study period. The questionnaire also included questions measuring the level of nutritional awareness of the mother.

The children were weighed before the start of the program, using the UNICEF balance (Uniscale) as well as Measuring their height in a recumbent way for children under two years and a standing way for children (24-59) months. Also, (hemoglobin gm / dl) were calculated.

After the information was collected from the study participants, the study sample group (A) was included in the program as follows: -

1. This group is divided into two smaller groups, each one includes (25) children. Each small group is reviewed on a specific day of the week.
2. Then, each small group was divided into two smaller groups, each one includes 12 or 13 children. These groups enter into discussion sessions managed by two mother and childcare doctors who are working in (PHCC) and sessions begin at Start eight thirty in the morning and end at one o'clock in the afternoon.
3. The children included in the study were given during the sessions the high-protein biscuit prescribed in the form of small meals when they came to (PHCC) and where the children are given regular milk under the supervision of the two doctors in (PHCC).
4. During these sessions, the issue of undernutrition was discussed with the mothers, and the debates were managed about their causes and about high-protein biscuits, its usefulness, how to give it, and focus on it being food.

Results

When examining the characteristics of groups (A) and (B), no significant difference was observed between the two groups with regard to the distribution of males and females within the two groups, the distribution of age groups, the degree of general crowding, the educational level of the mother, the type of breastfeeding used for children who are two years old in the two groups, the date for the start of complementary foods, the percentage of mothers with a high score in the measurement of information about undernutrition before the start of the program, the measurement and classification of the nutritional status of the children of both groups, the proportion of children with anemia within the two groups, the occurrence of diarrheal diseases and acute respiratory infections in the month prior to the start of the study program on the children of the two groups.

Table (1) shows the effect of the program on the incidence of acute respiratory infections and diarrhea within the study sample. The table shows the clear decrease that occurred in the occurrence of these diseases with the progression of the study months, which was stronger in group (A) than in group (B), as the correlation morale in group (A) was higher ($p < 0.00001$, $r = 0.954$) Than in group (B) ($p < 0.0001$, $r = 0.905$) A similar result appeared in the occurrence of diarrhea where the value of the correlation coefficient of group (A) ($r = 0.95$) and the significance level (p) was less than (0.001). A similar result also appeared in group (B), but the correlation coefficient value was lower ($r = 0.869$) and the level of significance was weaker ($p < 0.01$).

Table (2) shows the effect of the program on mother information regarding nutritional deficiency and the benefit of high-protein biscuit for a child with undernutrition and its contents, as it shows the progress achieved by the percentage of mothers with a high score (5,4) in measuring information. Progress in group (A) was higher than group (B), where the value of (p) for Group A was (<0.00001), while the value of (p) was for Group (B) (<0.0001)

After doing the (Z) test to compare the progress made between the two groups after the program.

It was noted that the progress made in group (A) was significantly higher than group (B) ($P < 0.01$) due to the question that included information on undernutrition, as well as the rate of progress was significantly higher in group (A) and significantly higher than group (B) ($P < 0.001$) in measuring information on high-protein biscuit and its contents.

Table (3) shows the progress made in the nutritional status of children in both groups, according to the weight / age index, where only 10% of children remained without improvement in group (A), and this means that nine out of ten children in this group have benefited from the program.

As for group (B), which follows the system in health institutions, about a third of the group's children (34%) remained the same.

This difference in the progress made between the two groups is a very high meaning difference ($P < 0.001$) and by using a weight / length index, 2% of children remained without improvement in group (A) compared to (14%) in group (B) and it is worth noting that this difference is statistically significant ($P < 0.05$), with respect to the length / age index, there was no significant effect for the program and in the two groups (74%) compared to (64%) in group (A) and 44%. Compared to (38%) in group (B).

As for the prevalence of anemia, Table (4) shows the effect

of the program on this prevalence, where there was a clear and significant decrease in the two groups, But a group (A) where the decline was higher than the group (B) and that for the age group (6-23) months. The table also shows that the age group (24-59) months has also benefited from the program and with very high significance for group (A) ($p<0.001$) and high morale for group (B) ($p<0.01$)

Table 1: The effect of the program on the incidence of acute respiratory infections and diarrhea within the study sample.

Occurring	Group	Study months						
		Previous Month	1	2	3	4	5	6
Acute respiratory infections	A	14%	10%	4%	4%	2%	2%	0%
	B	16%	12%	10%	6%	4%	4%	4%
Diarrhea	A	14%	10%	10%	4%	4%	2%	0%
	B	20%	12%	6%	6%	6%	4%	2%

Table 2: Progress achieved by the percentage of mothers with a high score in the measurement of information (4,5) before and after the program and in both groups.

Questions	Group (A)			Group (B)		
	before the program	after the program	(P) value	before the program	after the program	(P) value
What is undernutrition?	18%	92%	<0.00001	8%	70%	<0.0001
What does high protein biscuit benefit a child with undernutrition?	12%	96%	<0.00001			<0.0001
Do you know its contents?	14%	98%	<0.00001	8%	70%	<0.0001

Table 3: The percentage of children with undernutrition before and after the program for the two groups, according to the weight / age, weight / length, length / age index.

Nutritional status (-2 standard deviation from mediator) the indicator	GROUP (A)				GROUP (B)				(P) value
	before the program		after the program		before the program		after the program		
	no.	%	no.	%	no.	%	no.	%	
weight/age	50	100%	5	10%	50	100%	17	34%	<0.001
weight/ length	13	26%	1	2%	15	30%	7	14%	<0.05
length/ age	37	74%	32	64%	22	44%	19	38%	<0.02

Table 4: The effect of the program on the prevalence of anemia among children of both groups before and after the program.

Age group	GROUP (A)				GROUP (B)				(P) value
	before the program		after the program		before the program		after the program		
	no.	%	no.	%	no.	%	no.	%	
(6-23) month	15	30%	1	2%	14	28%	6	12%	<0.05
(24-59) month	25	50%	3	6%	30	60%	17	34%	<0.01

Discussion

This study was distinguished by the choice of two important segments in society, the first being children under the age of five and the second is mothers.

The first segment is that most vulnerable group among the world's population and is also the future of civilization, knowing that this segment constitutes about a quarter of the population of Iraq [4], more than ten years of the economic blockade imposed on Iraq directly affected the health and nutrition status of this sensitive group in society for this reason, the efforts continued by the Ministry of Health in the Republic of Iraq and UNICEF to save Iraqi children from the problem of undernutrition(5). And where the lack of nutrition is one of the leading causes of morbidity and mortality around the world(6), and the second segment, the mothers who bear the greatest burden in the responsibility of caring and protecting the child and work to ensure his growth and development as the mother is the backbone of the family, and for this reason, the current study aimed to increase her awareness and enhance her conditions for the benefit of her children, and its benefit mainly, as well as for the benefit of her family members and society in general.

The Eastern Primary Health Center has been chosen as a location to conduct the study, because it provides its services to a large and crowded residential area where the number of its population reaches (82480) and the number of children under five years of age is (14021) this number presents (17%) of the population And the number of women of childbearing age is (17448), this number presents (22%) of the population, and the percentage of general undernutrition in this region ranges from (25-30%) of the number of children examined [7], this study is a randomized controlled trial where the study sample which is group (A) and the control sample is group (B) was chosen systematically [8].

The results of this study showed that there is no significant difference in all characteristics of the study sample and for the two groups with regard to gender, age group, degree of crowding, the educational level of the mother, the type of breastfeeding followed by the mother, and the date of the start of complementary foods for children under two years of age and also the level Information for mothers with regard to undernutrition and the benefit of high-protein biscuit for a child with undernutrition and its contents, as well as the standard that each question obtained in measuring maternal information regarding.

High protein biscuit, which means that the choice of the study sample (the sample and the witness) was within the correct contexts. In this study, the nutritional status was monitored before and after the application of the program based on the weight index attributed to age and weight attributed to height, in addition to a study of the level of hemoglobin to measure the prevalence of anemia among the study sample.

The study of measurements such as weight and height is quick, simple and inexpensive and requires limited training [9]. This is why it is used by international organizations to monitor the nutritional status of nations [10]. In most developing countries, including Iraq, child growth is monitored by weight at regular intervals and recorded on the growth chart, which is the most common way to estimate nutritional status [11].

The weight attributed to age is a sensitive indicator that is affected by the occurrence of different infections on the child and the type of nutrition and its general surroundings, in addition to being easy to learn and used tools with a low cost, in addition to being used by health and community centers in the country. As for the height index, attributed to age, it measures the previous nutritional status, as it is difficult to treat chronic undernutrition after the child reaches the second to three years of age, and the dwarf child often grows into an adult dwarf from the continuing effect of the same process on the children she gives birth to [10].

As for the weight index in relation to height, it is not necessary to know the age of the child, which is difficult to verify in many cases, especially in rural areas, and is used to monitor the growth of children for a limited period and it indicates acute undernutrition that occurs as a result of the occurrence of infection or Severe lack of child nutrition [11].

One of the errors that occurs during the examination is the difference in the measurement of length, and this is due to the increased compression of the spine at the end of the day [9].

The study demonstrated the existence of significant progress in maternal information regarding nutritional deficiency and the benefit of high-protein biscuit for a child with undernutrition and its contents, that progress in the proportion of mothers with a high score in the measurement of information and the standard obtained by each question in the measurement of information and the standard that has occurred Accordingly, each question in measuring information was significantly higher in group (A) ($p < 0.00001$) than in group (B) ($p < 0.0001$) This is attributed to the implementation of the designed program, which emphasized group sessions and educated mothers about the basics of nutrition in a friendly and sympathetic manner with them and Emphasizing that food is not the main reason for the occurrence of undernutrition but rather other factors such as lack of family planning and artificial feeding, and various infections, and emphasizing the optimal use of high-protein biscuits by limiting it to the child with undernutrition and not selling it, but rather eating it with juice or alone and not to take it with tea because it disrupts the absorption of iron.

It was emphasized to provide the mother with knowledge about the importance of breastfeeding in preventing the occurrence of undernutrition. In these meetings, it was emphasized to follow up the children's weight every month, and to record the results of the monthly weight on the growth monitoring chart, and this would make the normal child growth or lack of it clear to the mother. Its use in Indonesia has proven its distinctive benefit in the struggle for nutritional health. This method was applied in Tamil Nadu district in India, where health workers used the method of growth monitoring within a program that contributed to reducing the incidence of undernutrition among children by (50%) in (9000) Village at a cost of about (10) dollars for child per year [4].

The association between the incidence of acute respiratory infections and months of study in group (A) was stronger than in group (B), where there was a significant decrease in the rate of acute respiratory infections from (8%) in the previous month of the study to (0%) in the last month of the study, due to the continuous monitoring of children by the researcher and the mother to improve the nutritional status and educate the mother about the way to deal with the child during illness. It is worth noting that children who are undernourished may be more likely to develop infections.

This was confirmed by a study conducted in Baghdad, where it was found that (72.5%) of pneumonia cases in children under five years old were suffering from various degrees of undernutrition [12].

This study demonstrated a significant correlation between the percentage of diarrhea and months of study, which was stronger in group (A), where the percentage of infection from (14%) in the previous month of study decreased to zero in the last month of the study.

As for the nutritional status, there has been a clear and significant improvement in the nutritional status of the study sample according to the child's weight index relative to his age, because this indicator shows general undernutrition and includes a mixture of acute and chronic undernutrition where one or both of them cause low weight and the improvement was significantly higher, so the rate of general undernutrition decreased from (100%) to (10%) compared to the control sample, where it decreased to (34%) only, which means that the study will benefit from the program as a result of the best use of high-protein biscuits. As for relying on the child's weight index, attributed to his height, which reflects symptoms such as diarrhea and respiratory infections in combination with the deficient nutrition, there was also a clear improvement in the study sample, where the acute nutritional deficiency rate decreased from (26%) to (2%) compared to the control sample. It decreased from (30%) to (14%) only, and this is due to two reasons, one of them is the lower incidence of infection and the other is the best use of high-protein biscuit. The association of height in relation to age with previous feeding and weight in relation to height with current feeding has great value in distinguishing between impairment of growth and atrophy in children under five years of age. The social and economic situation has an impact on the nutritional status of children whose ages (0-5) years are of great importance, as a study conducted in Kuwait in 1985 showed that children who are from socially and economically low areas in general are more short, lower weight, and more atrophied among those who are from socially and economically high areas, The study attributed this to the lack of nutrition. As this situation has improved dramatically from the age of 4 years of age when compulsory education begins, and where the Ministry of Education in Kuwait used to provide school meals, it may have been the determining factor for the impressive improvement [13].

With regard to the prevalence of anemia, a study conducted in Baghdad over a two-year period in which (45) cases of Iraqi children attending the Consultative Clinic for Pediatric Diseases at the University Hospital confirmed the presence of iron deficiency in all of these children, and the diagnosis of the cause of this deficiency was poor nutrition [14]. The effect of the program designed in the current study was positively reflected on the prevalence of anemia, where there was a clear and significant decrease in prevalence in both groups, but this decrease was more in group (A) ($p<0.001$) than in group (B) and that for the age group (6-23) month and this is due to the improvement in the nutritional status due to

the best use of biscuits that contain a number of minerals such as iron and calcium, and where it was emphasized not to use high-protein biscuits with tea, which disrupts the absorption of iron and emphasize its use with juice that helps on that.

Conclusions

The best use of high-protein biscuits and through the application of the program designed in this study led to a clear progress in the level of nutritional awareness among mothers in the study sample compared to the control sample as well as this use led to a decrease in the incidence of acute respiratory infections, diarrhea, improved nutritional status and a clear and significant decrease in the prevalence of anemia in the study sample compared to the control sample, this study recommends the approval of the program that was conducted in all (CC) in the country.

The best use of high-protein biscuits and through the application of the program designed in this study led to a clear progress in the level of nutritional awareness among mothers in the study sample compared to the control sample as well as this use led to a decrease in the incidence of acute respiratory infections and diarrhea and improved nutritional status and a decrease Clear and significant in the prevalence of anemia in the study sample compared to the control sample, this study recommends the approval of the program that was conducted in all (CC) in the country.

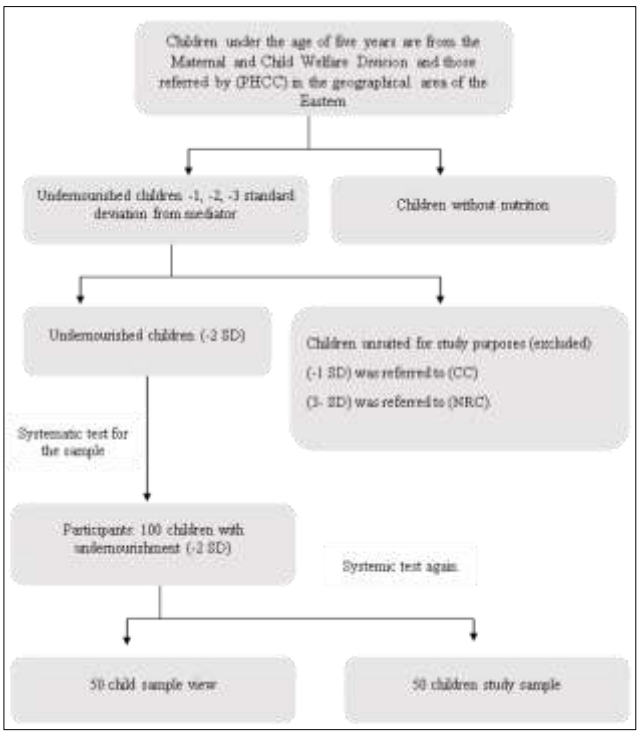

Fig 1: method of testing the study sample

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