

Meat product consumption among children aged 1–3 years in Baquba City, Iraq

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ABSTRACT

The caregiver should prioritize meats in the infant's diet during the last 6 months due to their sources of nutrients and proteins. This study aimed to identify the prevalence of meat product consumption among children aged 1–3 and their preferences based on age and sex. We conducted an analytical cross-sectional study on 810 children aged 1–3 years using a questionnaire. We used the chi-square test, and a p-value < 0.05 was considered significant. The study found that 60.3%, 86.2%, 85.4%, and 59.3% consumed red meat weekly ($p \leq 0.001$), fish monthly ($p \leq 0.001$), chicken weekly ($p \leq 0.001$), and eggs daily ($p \leq 0.001$), respectively. The second-year children prefer to consume red meat (44.8%), fish (46.3%), chicken (45.2%), and eggs (44.2%) more frequently than in other years. Males preferred red meat, fish, chicken, and eggs more than females (54.1% vs. 45.9%; 52.7% vs. 47.3%; 54.5% vs. 45.5%, and 54.4% vs. 45.6%), respectively. In conclusion, the consumption of chicken and eggs is more prevalent. In the second year of life, children, particularly boys, consume more meat products due to their own or their parents' preferences. We suggest expanding the scope of this study to include dairy products.

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1. INTRODUCTION

Previous studies on child nutrition did not determine the consumption rates of meat and eggs in the first, second, and third age groups, nor did they lack classification of the consumption frequency of these foods on a daily, weekly, or monthly basis. There is a widespread belief that a child's dietary preferences are unrestricted. However, empirical evidence contradicts this belief, as studies have shown that the food choices available to children significantly influence their consumption patterns and preferences [1]. In the past three decades, the central region of Iraq has experienced extensive economic and social transformations that have had a substantial effect on the health and nutrition of children [2]. Additionally, there are gaps in the current literature concerning the dietary intake of toddlers [3]. Therefore, we conducted this study to uncover the daily meat product consumption rates.

Maciel *et al.* [4] and Heemann *et al.* [5] have examined how children consume different types of food groups, revealed differences in their consumption rates, and can complement these foods through the consumption of meat products. This may increase dietary diversity to meet all micronutrient needs. Over time, studies have advocated for dietary diversity based on the number, frequency, and consumption of food groups [6], avoiding dependence on minimum dietary score foods, such as grains, vegetables, and fruits, and adding high dietary score foods, such as meat, fish, and eggs [7].

Protein is a crucial macronutrient that plays a vital role in supporting the proper progression of development and provides the necessary materials for growth, muscle building, and overall well-being to diverse cells inside the body [8]. Studies have reported how eating protein-rich foods affects early life outcomes in both undernourished and overnourished populations [9]. Across different age groups over time, the World Health Organization (WHO) and the Food and Agriculture Organization have reported observed fluctuations in protein and amino acid requirements [10].

Meat is known to be an important protein-rich food source, which in turn plays a crucial role in supporting human overall health during growth periods [11]. In addition to its rich content of vital minerals such as iron, selenium, and zinc, and vitamins, the most important of which are vitamins A, D, and B12; thiamine, and niacin. Therefore, the inclusion of meat in children's diets in limited quantities is imperative because of its high micronutrient content, which is essential for children's health [12]. Proteins determine the quality of nutrients because their structure is simple, which makes it easier for enzymes to break them down in the digestive system. As a result, the rapid solubility and digestion of proteins in fish make them highly significant for human growth and development [13]. Meat, fish, and eggs are considered highly nutritious sources of protein and iron, making them suitable for inclusion in a child's diet two to three times daily. However, it is crucial to remember to consume these foods in moderation [14]. We warrant this caution because dietary patterns can significantly affect a child's overall physical and mental development, and these habits may persist into adulthood [15]. The early introduction of eggs to children is crucial for their overall development, particularly in mitigating the risk of stunting [16]. The hypothesis suggests that eating at least one egg a day for at least 6 months increases choline, a substance critical to the functioning of certain important biological processes in daily life, including cognition, memory, and metabolism [17]. This, in turn, may also increase vitamin B12 levels, which is essential for proper nerve function. Additionally, studies have found that eggs enhance the biomarkers associated with essential fatty acids [18]. This study aimed to identify meat product consumption patterns (frequencies), preferences, age, and sex differences among children aged 1–3 years in Baquba City, Iraq.

2. METHOD

We conducted a study at the first and second Al-Tahrir primary healthcare centers in Baquba City, Iraq, over a defined period from September 10, 2022, to July 20, 2023. We conducted this study as an analytical cross-sectional study, specifically focusing on mothers and their children aged 1–3 years. We selected participants from those undergoing immunization or weight and height assessments at primary healthcare centers. The aforementioned healthcare centers are located in the central region of Diyala province and serve children of all ages and from all regions of the province. To be eligible for participation, the toddlers should fulfill two specific criteria: first, they had to fall within the age range of 12–36 months, and second, their mothers had to express willingness to participate in this study. However, this study excluded children who were sick, sensitive to eggs or fish, or older than 36 months. To determine the exact sample size, the total population of children aged 1–3 years who showed behavior within the sample was taken into account, based on the latest statistical data for the population census of Diyala governorate, 2021 [19]. The confidence level was 95%, with a 3.44% corresponding margin of error. We got a sample size of 809 children and then chose 810, as calculated using the following formula [20]:

$$\begin{aligned}\text{Unlimited population} & : n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2} \\ \text{Finite population} & : n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}\end{aligned}$$

We developed a concise questionnaire for this study after conducting an extensive evaluation of existing relevant research. The first author was responsible for interviewing respondents and collecting data. We selected the participants using a straightforward random sampling technique to ensure an accurate representation of the entire population and minimize any potential biases in the selection process. The questionnaire served as the primary instrument in this investigation. We assessed the validity of the questionnaire by administering it to a panel of five experts to determine the internal validity of the data. Several adjustments were implemented. To assess the test–retest reliability, we conducted a pilot test on a sample of 10 individuals who were not involved in the study. To test reliability, we used reliability coefficients (95.2% inter-examiners and 93.6% intra-examiners).

The study questionnaire's reliability coefficients were 0.81 for internal consistency based on alpha (Cronbach) and 0.70 for test–retest reliability based on Spearman–Brown. To reduce the confounding effect,

we used a randomization technique that did not assume it to be constant. This method reduces the risk of confounding because the groups it produces are reasonably comparable in terms of known and unknown confounding characteristics. The researcher documented the age and gender of the participants and retrieved the child's date of birth from the immunization card, which was readily available during the interview. The primary dependent variable under investigation was meat consumption. This study considered the following variables: the specific type of meat consumed, the child's age, and the frequency of meat consumption. A value of "1" was assigned for consumption of any form of animal product, and a value of "2" was assigned for nonconsumption. We assessed the frequency of meat consumption using a scoring system, assigning values of 1, 2, and 3 for daily, weekly, and monthly consumption, respectively.

The researcher used a food record that was incorporated into the questionnaire to record the child's age, gender, and frequency of meat consumption (daily, weekly, and monthly). This study involved the collection of data on several child characteristics, including age and sex. We also collected data on the child's consumption of meat, fish, poultry, and eggs and the frequency with which the mother provided protein-rich meals. The primary goal of the questionnaire was to collect demographic and dietary data in the vernacular language of the region. In this study, we assigned boys and girls numerical values of 1 and 2, respectively. Additionally, we categorized age into three stages: first, second, and third years, assigning corresponding values of 1, 2, and 3, respectively. To ensure that the toddlers consume enough of these protein foods for their health, the American Academy of Pediatrics recommends that children aged 1–3 years have two servings (200 calories) of meat, chicken, fish, and eggs daily; each serving equals 2 tablespoonfuls for meat and 1/2 any size for eggs, including yolk and white [21]. The limitations of this study restrict the researcher's focus to common and highly protein-containing meat products in Iraq, excluding dairy and plant products.

- Statistical analysis

We conducted a statistical analysis using SPSS Inc. software, Chicago, Illinois, USA, version 24.0. Age, sex, and the frequency of eating meat, fish, poultry, and eggs played a role in determining the proportion of children. We used the Chi-squared test to examine differences between categorical variables in the same population, considering a p -value ≤ 0.05 statistically significant. We characterized all sociodemographic and meat consumption variables before the analysis.

3. RESULTS AND DISCUSSION

3.1. Sociodemographic characteristics and meat product preferences

This study mainly focused on animal protein-rich preferences and the consumption of toddlers aged 1–3 years. Accordingly, Table 1 shows that a proportion of toddlers (58.4%) preferred red meat in their dietary habits. This is a good practice due to meat being a rich source of high biological protein and trace minerals such as iron, selenium, and zinc, particularly unprocessed meat products [11]. This finding was comparable to that of other studies [22].

Fish is another important protein–fatty food, and its regular consumption is an essential part of a child's healthy diet [23]. Table 1 also shows that the majority of children (61.9%) preferred fish. This proportion was comparable to that of another study [24] and higher than that of several other Arabic studies [25].

Table 1. Analysis of sociodemographic characteristics and meat product preferences

Characteristics	Variables	N	%	Characteristics	Variables	N	%
Age groups	First year	228	28.2	Fish	Yes	501	61.9
	Second year	340	41.9		No	309	38.1
	Third year	242	29.9		Total	810	100
	Total	810	100	Chicken meat	Yes	602	74.3
Sex	Males	436	53.8		No	208	25.7
	Females	374	46.2		Total	810	100
	Total	810	100	Eggs	Yes	669	82.6
Red meat	Yes	473	58.4		No	141	17.4
	No	337	41.6		Total	810	100
	Total	810	100				

N, number

In this study, chicken was the most consumed meat among other meat types, as shown in Table 1; this was similar to a study by Verduci *et al.* [26]. We can attribute this to the affordable and readily available nature of chicken meat and their religious acceptance [27]. Moreover, most people of different ages worldwide prefer to consume chicken meat. In recent decades, the popularity of poultry meat and eggs has increased in numerous countries, including Iraq [28], [29].

This study revealed that toddlers' egg consumption was high (82.6%) compared with that of other meat products, as shown in Table 1. This finding was comparable to another research study [30] and higher

than that of another previously reported study [31]. The lack of attention to including a protein-rich food in the usual child's diet may be due to several reasons, the most important of which are low socioeconomic status, the parent's convictions and behaviors, the child's and his/her mother's preferences, and differences in dietary habits and religious beliefs [32].

3.2. Consumption rates of meat products by frequency

On the basis of the data in Table 2, the majority of children (60.3%) significantly consume one serving of red meat weekly, and only 1.7% consume two servings of red meat daily ($p \leq 0.001$); 86.2% significantly consume one serving of fish monthly ($p \leq 0.001$), and only 4% consume two servings of fish daily; 85.4% of them significantly consume one serving of chicken meat weekly ($p < 0.001$), and only 10% consume two servings of chicken daily. In contrast, more than half (59.3%) consume two servings of eggs daily, and over a third of them consume eggs two to three times weekly ($p \leq 0.01$).

In this study, as shown in Table 2, 60.3% of children consumed one serving of red meat weekly; this rate is higher than the weekly meat consumption by preschool children in Sri Lanka (27.6%) [33] and several other Arabic studies [25]. According to the American Academy of Pediatrics [21], the mother should give portions of meat and eggs to her child two times daily. In this study, only 1.7% of toddlers consume two servings of red meat daily, and that's not enough. This rate was close to that of another Sri Lankan study, which found that 1.2% of preschoolers consume two servings of red meat daily [33], but much lower than this study [34].

Table 2 shows that weekly fish consumption is low (9.8%), and most toddlers (86.2%) consume fish once a month. Fish intake by children twice weekly is better than red meat intake because it contains large quantities of healthy fats (omega-3) and soluble fat vitamins [35]. In this study, both weekly and monthly fish consumption could not be satisfactory, although fish is widely available in Iraq [36]. In comparison, approximately 95.8% of Sri Lankan children consume fish at a low frequency of ≥ 1 time monthly [33]. This may be due to a lack of awareness of the nutritional and health benefits of fish [37]. Eating fish at least once weekly lowers the risk of neurodevelopmental retardation, with the child's microbiome further influencing this link [38].

In this study (Table 2), toddlers consumed two servings of chicken daily at a low rate (10%). In comparison, another Arabic study found that for children aged 12–27 months, the mean daily chicken meat consumption was low [39]. Table 2 affirms that approximately 60% of children adhere to the recommended daily intake of eggs, which is two servings daily. Other Arabic research [40] revealed that eggs were one of the least common protein foods introduced to children.

Table 2. Analysis of meat consumption rates of meat products by frequency (non-consumers excluded)

Food type	Intake	N	%	χ^2	p-value	Food type	Intake	N	%	χ^2	p-value
Red meat	Two servings daily (recommended)	8	1.7	248.072	<0.001	Chicken meat	Two servings daily (recommended)	60	10.0	736.439	<0.001
	One serving weekly	285	60.3				One serving weekly	514	85.4		
	One serving monthly	180	38.1				One serving monthly	28	4.7		
	Total	473	100				Total	602	100		
Fish	Two servings daily (recommended)	20	4	633.281	<0.001	Eggs	Two servings daily (recommended)	397	59.3	341.552	<0.001
	One serving weekly	49	9.8				One serving weekly	260	38.9		
	One serving monthly	432	86.2				One serving monthly	12	1.8		
	Total	501	100				Total	669	100		

N, number; χ^2 , Chi-squared value

3.3. Intake rates of meat products by age and sex

On the basis of the data in Table 3, children in the second year of life consume red meat (44.8%), fish (46.3%), chicken (45.2%), and eggs (44.2%) more frequently than children in the first and third years of life ($p \leq 0.01$; Table 3). These findings suggest that mothers prioritize breastfeeding or artificial feeding in addition to light and semisolid foods during the first year of life, while reducing their toddlers' meat and egg consumption. Fish consumption among the young children's community provides many fat-soluble vitamins, the most important of which is vitamin D. A study in Bangladesh showed that infants aged 12–24 months who did not consume fish were more likely to exhibit vitamin D deficiency [41]. According to a study in Senegal, children significantly consume fish [42]. Other findings in Bangladesh indicate higher food intake rates from

an animal source, such as fish, which was significantly associated with the family's economic status and the mother's education [43]. The WHO has stipulated those mothers or caregivers should provide foods such as eggs daily or whenever possible to breastfed and non-breastfed babies between the ages of 6 and 23 months because they promote high nutrient levels necessary for growth [44]. Therefore, eggs are readily available, inexpensive compared with other products, and simple to prepare and palatable to children [16]. Some mothers refrain from introducing fish to their child during the first year of life, fearing that it may not be age-appropriate. However, experts have previously recommended delaying the child's consumption of fish, and recent research has shown that there is no need to delay the introduction of allergens, preferably early, at the age of 4–6 months, in small and spaced amounts, which may help prevent allergies [45].

This study shows a decrease in meat and egg consumption rates in the third year of a child's life. One possible explanation is that children in this age group rely on their own choices when selecting meals and have a predisposition to consume sugary foods and drinks. A Chinese study revealed that the frequency of consumption of sweetened foods and beverages in children over the age of 2 years is higher, as this consumption was associated with a lower educational level of the mother, selective eating, and higher daily screen time rates [46].

Table 3 revealed that male children preferred more meat (54.1% vs. 45.9%), fish (52.7% vs. 47.3%), chicken (54.5% vs. 45.5%), and eggs (54.4% vs. 45.6%) than female children (Table 3). This study's findings did not provide statistically significant evidence to establish a correlation between the consumption of red meat and the sex of children ($p \leq 0.05$). During the interim period, a significant association was detected between the consumption of poultry, primarily chicken and eggs, and the sex of children ($p \leq 0.05$). This study revealed that male toddlers consumed more red meat, fish, chicken, and eggs than female toddlers. Fatima et al. found that the average red meat and fish intake of preschool children was higher among boys, with no significant statistical difference [33]. Moreover, another study reported that male children like to eat meat, fish, and poultry more than female children [47]. The mothers could have less influence than fathers in reducing meat consumption in children because they found that fathers showed a higher association with the effect of increased infant meat consumption compared with mothers.

Although giving fish to children during the initial year of life is very beneficial in preventing diseases such as eczema and other allergic diseases, such as asthma and allergic rhinitis [48], [49], the proportion of children who consumed fish during the first year of life was low in this study. Male toddlers like meat products and eggs more than female toddlers; girls prefer fruits and vegetables, whereas boys like fatty foods, meat products, and eggs [50]. The strength of this study lies in its first attempt (to our knowledge) to investigate the prevalence and consumption frequencies of red meat, chicken, fish, and eggs among children aged 1–3 years, including sex and age variations.

Table 3. Analysis of intake rates of meat products by age and sex (non-consumers excluded)

Table 3.7. Analysis of intake rates of meat products by age and sex (non-consumers excluded)										
Type of protein food	Grade	Age groups		χ^2	p-value	Gender	Child's sex			
		Intake					Intake		χ^2	p-value
		N	%				N	%		
Red meat	First year	85	18.0	54.347	<0.001	Males	256	54.1	3.216	0.075
	Second year	212	44.8			Females	217	45.9		
	Third year	176	37.2			Total	473	100		
	Total	473	100							
Fish	First year	85	17.0	67.293	<0.001	Males	264	52.7	1.455	0.228
	Second year	232	46.3			Females	237	47.3		
	Third year	184	36.7			Total	501	100		
	Total	501	100							
Chicken meat	First year	126	20.9	53.196	<0.001	Males	328	54.5	4.844	0.028
	Second year	272	45.2			Females	274	45.5		
	Third year	204	33.9			Total	602	100		
	Total	602	100.0							
Eggs	First year	169	25.3	38.592	<0.001	Males	364	54.4	5.203	0.023
	Second year	296	44.2			Females	305	45.6		
	Third year	204	30.5			Total	669	100		
	Total	669	100.0							

N, number; χ^2 , chi-squared value

4. CONCLUSION

In conclusion, consumption of chicken meat and eggs is more prevalent among children aged 1–3 years. Children frequently consume meat items in their second year of life because of either their own or their parents' preferences. Insufficient protein intake may increase the risk of stunted growth in children; further research is necessary.

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