# Evaluation of some demographic characteristics of mothers with malnourished children at Tikrit city

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**ABSTRACT**

Malnutrition is a condition in which an individual's diet does not provide the nutrients required for healthy functioning. It encompasses both undernutrition and overnutrition. This study evaluates the demographic characteristics of mothers with malnourished children under five years old in Tikrit City, Iraq. A descriptive cross-sectional study was conducted on 651 mothers, with data collected from January to May 2024. The study assessed the impact of various sociodemographic factors, including maternal education, socioeconomic status, marital status, occupation, and residential area on the nutritional status of children. Results revealed that malnutrition rates were higher among children whose mothers had lower education levels, were from low socioeconomic backgrounds, or lived in rural areas. Anthropometric measurements, including weight-for-age, height-for-age, and mid-upper arm circumference (MUAC), were used to classify malnutrition according to the Waterlow and WHO criteria. The findings concluded significant associations between maternal education, socioeconomic status, and occupation with child malnutrition. Addressing these disparities through targeted interventions is essential to improve child health outcomes in the region.

## INTRODUCTION

Malnutrition is a condition in which an individual's diet does not provide the nutrients required for healthy functioning. It encompasses both undernutrition and overnutrition. Undernutrition includes deficiencies in calories, protein, vitamins, and minerals,

leading to conditions such as stunting (low height for age), wasting (low weight for height), and being underweight (low weight for age). Overnutrition, on the other hand, refers to the excessive intake of nutrients, particularly fats and sugars, leading to obesity and related non-communicable diseases like diabetes and heart disease. Malnutrition can significantly impair growth, development, immunity, and overall health, especially in children (1).

Malnutrition is a pervasive global health issue, especially in developing regions, where factors such as chronic poverty, poor living conditions with pervasive deficits in sanitation and hygiene, a high prevalence of infectious diseases and environmental insults, food insecurity, poor maternal and fetal nutritional status and suboptimal nutritional intake in infancy and early childhood, these all factors contribute to the problem (2). malnutrition among children remains a critical concern, linked to a combination of socioeconomic, environmental, and cultural factors. The mothers of malnourished children play a crucial role in shaping their children's health outcomes, and understanding their demographic characteristics is essential for targeted interventions (3).

Demographic characteristics such as age, education level, marital status, occupation, socioeconomic status, and residence are key factors that influence maternal behaviors, including feeding practices and healthcare access. Research indicates that mothers from lower socioeconomic backgrounds, those with limited education, or those living in rural areas are more likely to have malnourished children due to restricted access to resources (4).

**Aim of the Study**

Decrease morbidity from malnutrition by assessing knowledge and attitude regarding malnutrition in children under 5 years of age.

**Objectives**

1. To explore the demographic characteristics of the mothers and children in the study case
2. To assess the knowledge of mothers about breastfeeding, complementary feeding, food items, source of knowledge of food, clinical features, risk factors, complications of malnutrition, mineral and vitamin deficiencies and management of malnutrition.
3. To assess the mothers' attitude regarding malnutrition in their children
4. To clarify the mothers' knowledge regarding the prevention of malnutrition
5. To identify the relation between the demographic characteristics of mothers and their knowledge and attitude regarding the type of malnutrition in their children.
6. To measure some anthropometric measurements (growth chart) regarding the assessment of nutritional status including (weight, height and MUAC).

**SUBJECTS AND METHODS**

**Study design and period of Study:** This study is a descriptive cross-sectional study conducted on 651 mothers in Tikrit city. Data were collected during the period starting (on 18$^{th}$ January 2024 and ending on 30$^{th}$ May 2024)

**The setting of the study:** The study was conducted in the city of Tikrit, from primary healthcare centers were

randomly selected to be designated for the study.

**Sample size:** The sample size was estimated using Steven K.Thompson equation (Steven, 2012): the following equation:

$$n = \frac{N * P(1 - P)}{\left(N - 1 * \left(\frac{d^2}{z^2}\right)\right) + p(1 - p)}$$

n= sample size, N: population size, Z: level of confidence of 95%, which is conventional is 1.96, d: error proportion (a degree of 0.05 was used)., P: probability (50%)

**Data collection method:** The questionnaire is an official assessment tool used by researchers through a set of questions and an interview with mothers after obtaining their approval.

**Anthropometric module and nutritional classification**

**Weight measurement:** A digital electronic scale was used for measuring the weight of children under 2 years old to the nearest 0.1 kg., in adult children over 2 years put a child with bare feet on a center scale also nearest to 0.1 kg., placed on firm flooring rather than carpet.

**Height measurement:** A wooden measuring board (sliding board) is used to measure the length of a child under 2 years old or couldn't stop the nearest millimeter, by laying down with a reading greater than the actual height by 1-2 cm., while Hight used to measure children over 2 years in a standing position the head should be in the Frankfurt position (position where the passing from the external ear hole to lower eyelid is parallel to the floor.

**Mid Upper Arm Circumferences (MUAC):** Special tape is used for measuring the MUAC of a child, the tape has three colours, with red indicating severe acute malnutrition, yellow indicating moderate acute malnutrition and green indicating normal nutritional status, measured by removing cloths from the left upper arm taking the distance between the shoulder and elbow joint.

**Waterlow classification:** The Nutritional status of the studied children was assessed using Waterlow criteria (5) as shown in table (1).

Acute malnutrition (i.e., wasting) measured weight deficit by the following equation: Weight deficit (%) = (Actual weight (kg) / Expected weight (kg) for actual height) × 100

Chronic malnutrition (i.e., stunting) measured height or length deficit by the following equation: Height deficit (%) = (Actual height (cm) / Expected height (cm) at 50th centile for chronological age) × 100

**WHO classification**: Upon completing the anthropometric measurements and matching their percentage with the special charts for each scale, which includes (weight for age, height for age, and weight for height) the percentages are classified according the table (2).

**Statistical Analysis:** This data was collected using a questionnaire and analyzed using the SPSS 25 statistical package. The data were presented in simple measures of frequency, mean, percentage, range, and standard deviation values. The Pearson Chi-square test (X2 - test) was used to determine the difference between various percentages (qualitative data). Statistical significance was considered when the P-value was equal to or less than 0.05.

**RESULTS**

The total number of the sample was 651 mothers. Table (3) demonstrated the highest age of the sample was 30-39

years and the lowest percentage 0.9% was in the age group (>=40) years. Regarding the education level of mothers, the highest number was 218 (33.5%) who graduated from college and higher. Married constitute a high percentage 631 (96.9) from marital status, and most of them residence in urban 532(81.7) areas, highest percentage of mothers were housewives 460 (70.7%) while most fathers 636 (97.7%) were employed. Regarding the type of house 377 (57.9%) of the study sample had own house followed by 240 (36.9) living in rent houses, the socioeconomic status level, the study sample showed 369 (56.6%) of the children were living in a low level, and followed by 161 (24.7%) live in a high level.

Table 4: shows the distribution of children according to their demographic characteristics, the study showed that a high percentage of children 306 (47.0%) aged (6-11) months, while the lowest percentage of children 23 (3.5 %) aged (24-35) months. 330 (50.7%) of them were male and 321 (49.3%) were female, and highest of them 249 (38.2%) were 1st sequences and 22 (3.4%) was 6th and more sequences. As well as highest percentage 593 (91.1%) was birth with normal weight and 58 (8.9%) was birth with low weight, 651(100%) didn't have any chronic diseases.

Table (5): Shows nutrition status according to WHO Classifications:

- Weight for Height (WH): The highest percentage was normal (5%-<85% percentile) 587 (90.2%) while wasting (<5% percentile) was 64 (9.8%).
- Height for Age (HA): the highest percentage was Normal (5%-<85% percentile) 573 (88.0%) and stunted (<5% percentile) was 78 (12.0%).
- Weight for Age (WA): the highest percentage was Normal (5%-<85% percentile) 430 (66.1%) and malnourished (<5% percentile) 221 (33.9%).
- MUAC: the highest percentage was Normal (>=12.5 cm): 619 (95.1%) while Acute Malnutrition (<12.5 cm) was 32 (4.9%).

Table (6) demonstrates Waterlow's classification index: The majority of study samples (children) were normal (Eutrophy): 507 (77.9%), followed by 93 (14.3%) stunting malnutrition, and 51 (7.8%) wasting malnutrition.

Figure (1) showed that a high percentage of children with non-malnutrition (77.9%) and (22.1%) with malnutrition according to the Waterlow classification

Table (7) shows the association of Socio-Demographic Variables and Waterlow's classification Index of the study sample, there was a significant association between several variables (the education of mothers, occupation of mothers, Socio-economic status, Age group of children, Sex) with Waterlow classification (p<0.05).

Table (1): shows the Waterlow criteria assume that the expected height and weight measurements of the child

| Index | Normal | Mild | Moderate | severe |
|---|---|---|---|---|
| (Wasting) Weight for height | > 90% | 90-80% | 80-70% | < 70% |
| (stunting) Height for age | > 95% | 95-90% | 90-85% | < 85% |

Table (2): Diagnosis by percentile for the indexes based on the World Health Organization (24)

| Percentile | Weight For Age | Height For Age | Weight For height |
|---|---|---|---|
| Less than the 5<sup>th</sup> percentile | Malnourished | Stunted | Wasting |
| 5<sup>th</sup> percentile to less than the 85<sup>th</sup> percentile | Normal | Normal | Normal |
| 85<sup>th</sup> percentile to less than the 95<sup>th</sup> percentile | Over Weight | Over normal | Over Weight |
| 95<sup>th</sup> percentile or greater | Obesity | | Obesity |

Table (3): Socio-Demographic Characteristics of Mothers

| Socio-demographic characteristics of mothers | | No. | % |
|---|---|---|---|
| Age groups of mothers | Less than 20 years | 12 | 1.8 |
| | 20-29 years | 297 | 45.6 |
| | 30-39 years | 336 | 51.6 |
| | >= 40 years | 6 | .9 |
| | Mean± SD (Range) | 29.9±5.7 (16-42yrs) | |
| Education of mother | Not read and not write | 80 | 12.3 |
| | Read and write | 87 | 13.4 |
| | Primary | 131 | 20.1 |
| | Secondary | 135 | 20.7 |
| | College and higher | 218 | 33.5 |
| Marital status (9) | Married | 631 | 96.9 |
| | Divorced | 17 | 2.6 |
| | Widower | 3 | .5 |
| Residence | Urban | 532 | 81.7 |
| | Rural | 119 | 18.3 |
| Occupation of Mother | Housewife | 460 | 70.7 |
| | Employed | 191 | 29.3 |
| Occupation of father | Employed | 636 | 97.7 |
| | Not-work | 15 | 2.3 |
| House type | Owner | 377 | 57.9 |
| | Rent | 240 | 36.9 |
| | Other | 34 | 5.2 |
| Socio-economic status | Low | 369 | 56.6 |
| | Medium | 121 | 18.5 |
| | High | 161 | 24.7 |

Table (4): Demographic Characteristics of Children

| Demographic characteristics of children | | No. | % |
|---|---|---|---|
| Age group of children (15) | 6-11 months | 306 | 47.0 |
| | 12-23 months | 158 | 24.3 |
| | 24-35 months | 23 | 3.5 |
| | 36-47 months | 37 | 5.7 |
| | 48-59 months | 127 | 19.5 |
| | Mean± SD (Range) | 20.6±17.9 (2-59 m) | |
| Sex | Female | 321 | 49.3 |
| | Male | 330 | 50.7 |
| Sequence of child | 1st | 249 | 38.2 |
| | 2nd | 174 | 26.7 |
| | 3rd | 110 | 16.9 |
| | 4th | 64 | 9.8 |
| | 5th | 32 | 4.9 |
| | 6th and more | 22 | 3.4 |
| Weight of child at birth | Low birth weight (2.5 Kg) | 58 | 8.9 |
| | Average (normal) BW | 593 | 91.1 |
| Chronic disease | No | 651 | 100% |
| | Yes | - | - |

Table (5): Nutritional Status of Children Based on WHO Growth Standards

| **According to WHO and CDC** | | **No.** | **%** |
|---|---|---|---|
| Weight for height (WH) | Wasting (<5% percentile) | 64 | 9.8 |
| | Normal (5%-<85% percentile) | 587 | 90.2 |
| Height for age (HA) | Stunted (<5% percentile) | 78 | 12.0 |
| | Normal (5%-<85% percentile) | 573 | 88.0 |
| Weight for age (WA) | Malnourished (<5% percentile) | 221 | 33.9 |
| | Normal (5%-<85% percentile) | 430 | 66.1 |
| Med Upper Arm Circumference (MUAC) | Acute Malnutrition (<12.5 cm) | 32 | 4.9 |
| | Normal (>=12.5 cm) | 619 | 95.1 |

Table (6): Nutritional Status of Children Based on Waterlow's Classification Standards

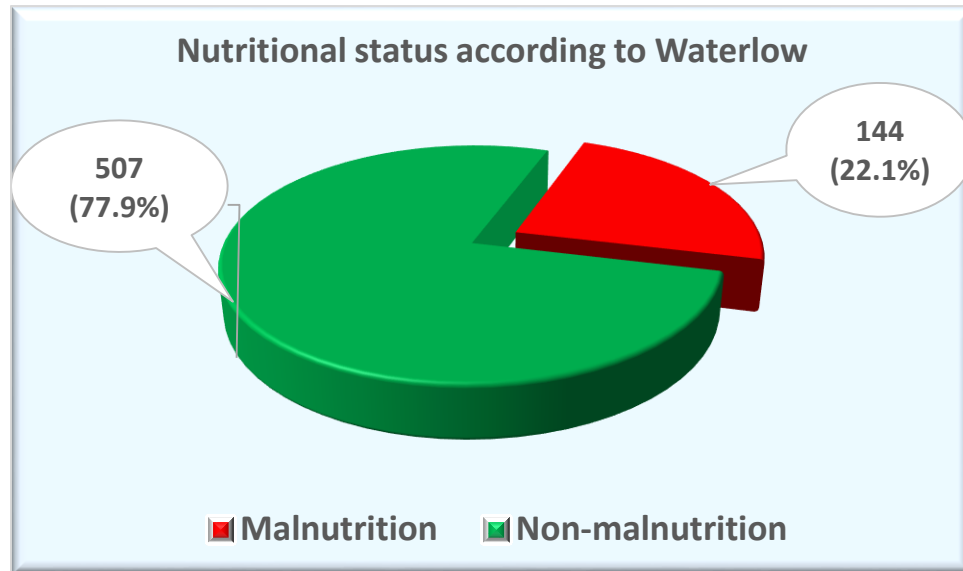| **Waterlow's Classification Index** | | **No.** | **%** |
|---|---|---|---|
| Nutritional status | Normal (Eutrophy) | 507 | 77.9 |
| | stunting (hight for age) | 93 | 14.3 |
| | Wasting (weight for height) | 51 | 7.8 |

**Figure (1): Nutritional status according to Waterlow**

## DISCUSSION

The age distribution of mothers in the study shows a predominant age range of 30-39 years (51.6%), followed by 20-29 years (45.6%), with a very small proportion >= 40 years (0.9%). When compared with other studies, this study is dissimilar to findings by Mutuku et al in 2020 found the majority of mothers (64.4%) were aged 20-29 years but similar to those aged above 40 years 4.8% (6), and agreed with Suharto in 2022 showed the highest frequency of mothers aged 31–35 years (27.64%) and the smallest frequency of aged 46–50 years 2.12% (7). This suggests that most mothers are within their prime reproductive years, which is consistent with other demographic studies indicating that women tend to have children in their late 20 years to early 30 years.

The education level of mothers varies significantly, with 33.5% having college or higher education, 20.7% having secondary education, and being able to read and write (13.4%), or being illiterate (12.3%). This is consistent with the results of Raji et al in 2020 found smallest of mothers did not read and did not write 31 (8.9%) (8), and with Berra in 2013 showed about 34.2% (n=82) had attended at least some sort of tertiary education and the smallest of mothers were Illiterate 5.4% (n=13) (9). While inconsistent with Suharto in 2022 showed most of mothers had secondary education by 53%, and a small proportion of mothers had higher education by 4% (7). This distribution in current study indicates a relatively high level of educational attainment among the mothers, which can positively impact child-rearing practices and access to healthcare information. A vast majority of the mothers (96.9%) are married, with only 2.6% divorced and 0.5% widowed, these results agreed with Berra in 2013, Bimpong et al in 2020 and Abdulahi et al in 2020 found 94.2%, 96% and 100% of mothers were married respectively (9) (10) (11). The high rate of marriage among the sample may influence the socio-economic stability and support

systems available for the families. The data shows that 81.7% of the mothers reside in urban areas, with the remaining 18.3% in rural areas this agreed with Ghazi et al in 2023 the highest percentage of mothers resident (89.3%) in city (Ghazi et al., 2023). Urban residency is often associated with better access to healthcare facilities, education, and employment opportunities, which can affect maternal and child health outcomes.

A significant portion of mothers (70.7%) are housewives, while 29.3% are employed, and fathers are predominantly employed (97.7%), suggesting a stable income source for most families. This result agreed with Ngimbudzi et al in 2016, Abdulahi et al in 2020 and Faeq Abdulzahra et al in 2023 found the majority of mothers 50%, 93.8% and 75.7% were housewives respectively, while disagreed with Faeq Abdulzahra et al in 2023 found the majority of fathers not employed (53.9%) (13) (11) (14). The high percentage of housewives reflects traditional gender roles in many societies but also highlights the economic dependence on the father's income. Regarding housing, 57.9% of families own their homes, while 36.9% rent and 5.2% have other housing arrangements. This result is consistent with Faeq et al in 2023 showed a high percentage of families (78.3%) own their home, 12..2% rent and 9.6% others (14). Homeownership is often a marker of financial stability and security, which can contribute to better living conditions and overall family well-being.

The socioeconomic status of the families highlighted that 56.6% are in the low category, 18.5% in the medium category, and 24.7% in the high category. The current study agreed with Saddam and Bahir in 2020 high percentage of

participants (55.6%) were in low-level socioeconomic status (Saddam & Bahir, 2020), and agreed with Ahmed et al in 2020 the highest percentage (23.39%) was in low-level socioeconomic status (16). This distribution indicates that more than half of the families might face economic challenges, potentially impacting their access to resources and services necessary for optimal child development and family health.

The largest group of children was 6-11 months (47.0%), followed by 12-23 months (24.3%). When comparing these results with other findings, similar to the findings of Ahmad et al in 2020 that found 584 (23.39%) aged of some months, 462 (18.5%) children aged 1 year, 479 (19.18%) children aged 2 years, 503 (20.14%) children as of 3 years, and 469 (18.78%) children were aged 4 years or below 5 years (16). While disagreed with both Batool et al in 2020 and Abdulzahra et al in 2022, they found most of the participants (55%) were sorted into the age group of (1-3) years, whereas 33% were from (3-5) years of age (17), and the majority of the children 71 (30.7 %) were between 12 and 23 months (18). The current study is notable and might reflect specific healthcare or nutrition interventions targeting this age group. In current study found the majority of children were male (50.7%) while female (49.3%), these results disagreed with Batool et al 2020 found more than half of the participants (53%) were female whereas, 47% were male (17), as well as with Abdulzahra et al in 2020 found females constitute more than half of 135 (58.7%) of the studied sample (18). These results highest of them 249 (38.2%) was 1$^{st}$ sequences and the lowest 22 (3.4%) was 6$^{th}$ and more sequences. Lower-order births being more common suggests effective family planning

practices in the current study population. This agreed with Özdoğan et al., (2012) found nearly half of the families (50.1%) had a single child (19). The current study find the smallest of children were born with low birth weight (8.9%) and normal birth weight (91.1%), these consistent with Rahman et al in 2016 found (16.7%) LBW (20). Relatively low percentage of low birth weight in the current study indicates good maternal health but contrasts with higher rates in some developing regions.

The current study found (9.8%) were wasting, 12.0% were stunted, 33.9% were underweight, while MUAC (Acute Malnutrition) was (4.9%) of children. In comparison with other studies, these results were not differences much than findings by Batool et al., (2020b) found 28% of children had stunting, 17% were found to be underweight and 7% of children were caught up with wasting (21), and lower than the findings of Mutuku et al., (2020) About of children (21.8%) were wasted, 26.0% of the children were stunted, 25.5% underweight (6). This may be nutritionally more accessible, and parents may receive more education on proper feeding practices. This could result in a reduction of underweight cases as parents are more informed on child nutrition.

Regarding to Waterlow's classification index: The majority of study samples (children) were normal (Eutrophy): 507 (77.9%), followed by 93 (14.3%) stunting malnutrition, and 51 (7.8%) wasting malnutrition, compared to which found 80% of children were normal, 2.7% of them 2.7 and 2.1 of them were wasting (22), Forh et al., (2022) analysed the nutritional status of the children and revealed that 10% were weight for their height (wasted), whereas 89.8% were normal. 8.3% of the children

were underweight and the rest of them were normal. On the other hand, children who were found to be stunted constituted 16.7% and the rest were normal (23).

the prevalence of malnutrition in the study population. high percentage of children with non-malnutrition (77.9%) and (22.1%) with malnutrition according to the Waterlow classification, this finding inconsistency with Abdulzahra et al., (2022) found the total prevalence of malnutrition among children under five in Babylon was 14.3% (18).

**CONCLUSION**

In conclusion, the education of mothers, occupation of mothers, Socioeconomic status, Age group of children and Sex had association with Waterlow classification and play pivotal roles in the nutritional health of children. Mothers with lower education levels and families from low socioeconomic backgrounds tend to have higher rates of malnutrition in their children. Addressing these demographic disparities through targeted interventions, educational programs, and improved healthcare access is essential for reducing malnutrition rates and improving child health outcomes.

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