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Original Article

Patterns and Determinants of Double Burden Malnutrition at Household Level in Babylon

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Abstract

Background: The double burden of malnutrition (DBM) is a complex problem involving the coexistence of under- and overnutrition within the same individual, household, or population. Our study focused on double burden malnutrition at the household level, which happens when a mother is overweight or anemic, and a child is underweight in the same household. We characterized it as a household with an overweight or obese mother (OBM) and at least one child younger than the age of five who is malnourished. This double burden is assumed to have arisen as a result of low- and middle-income nations' nutritional transition, as well as due to rapid changes in food production, eating patterns, and physical activity. Despite the fact that being underweight has long been regarded a major issue, overweight and obesity have been identified as a growing problem. **Objective:** The primary goal of this study was to evaluate the DBM at the household level in Babylon governorate, as well as the significant factors that influence it. **Materials and Methods:** The study was carried in Iraq in 205 families in Babylon province at level of houses. The houses were chosen randomly. Selection geographical area and systemic random of sampling we choose the fifth house in each area, if there were no children or children with chronic diseases, we would pass it to the next fifth house. The study was conducted in urban and rural areas. In Al-Hilla Center choose (al mohandessein, al akrammeen, and al gamiaa) and in area rural of hilla included (Hamza Al-Dali Village, Karragol, and village fzaa) in north of Babylon choose Al-Musayyib District (almuealimin and AL-Sajjad District) rural to Al-Musayyib we choose (Al-Jilawiyeh Village and Hor Hussein) and Babylon hospital for women and children. **Results:** In this study, all families were included. Overweight or obesity was seen in 5.37% of mothers and stunted children, and in 3.41% of OBM and underweight children. In all families, there was an 8.78% prevalence of any concomitant DBM. Higher maternal age, households with more than two members, and a lower food diversity score were all found to have statistically significant positive relationships. **Conclusions:** Despite the small sample size, the prevalence of DBM is considered significant and alarming and may be higher in larger survey studies. In Babylon, higher maternal age and the presence of more than one kid younger than the age of 5 years were linked to greater odds of household DBM, and both played important roles in pushing the DBM trend upward.

Keywords: Diet diversity score, double burden, malnutrition, overweight, stunting, undernutrition

Introduction

DBM is a recent medical term arising side by side with the modernization of communities toward the western lifestyle; it is scientifically termed "epidemiological transition." DBM is defined by the coexistence of undernutrition along with overweight and obesity, or diet-related noncommunicable diseases (NCDs), within individuals, households, and populations, and across the lifecourse.[1] It assumed that this double burden arose as a result of the nutritional transition in low- and middle-income countries (LMICs), as well as due to rapid changes in food production, eating patterns, and physical activity.[2] "Nutritional transition" refers to a sequence of nutritional shifts that have happened over the course of human history and these result in a shift away from a diet that is predominantly centered on locally accessible staple grains, vegetables, and fruits, toward a diet heavier in fat, sugar, animal-origin foods, and processed meals that are

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lower in fiber.[3] NCDs are a major cause of disease, with large economic consequences, particularly in low- and middle-income developing nations.

The risk of NCDs is exacerbated by a complicated interplay between early undernutrition (in mothers before and during pregnancy, and in early infancy) and later overnutrition. In LMICs, the prevalence of this is quickly increasing.[4]

The DBM can occur on three levels: the population level (where both undernutrition and overweight/obesity or NCDs are prevalent in the same community, region, or country), the household level (in which family members are affected by various forms of malnutrition), and the individual level (through the simultaneous development of two or more types of malnutrition or the development of multiple types over a lifetime).[1] The presence of DBM at these levels is concerning, because both underweight and overweight individuals, communities, and health-care systems are well documented to have a variety of negative effects for survival, chronic illness incidence, health development, and economic productivity.[5,6] This leads to the inclusion of the goal of eliminating all forms of malnutrition worldwide within the Sustainable Development Goals.[7] Family level (or household DBM) is more commonly caused by an OBM and undernourished children in the same household, referred to as maternal overweight/undernourished children (MOCU).[8,9]

There is significant variation between countries in the incidence of DBM within families. A survey of 131 developing countries found that the coexistence of overweight mothers and undernourished children in families ranges from 1.8% in Ethiopia to 15.9% in Egypt.[10]

The objectives of this study were as follows:

(1) to get an idea about the prevalence of DBM at the family level in Babylon governorate.
(2) to determine the factors associated with the development of DBM within families and the characteristics of these families.

Materials and Methods

Study design and setting of study and time

This study was a cross-sectional study conducted in Iraq in Babylon governorate at the household level. This study was conducted among mothers, aged < 15–49 years, and their children younger than 5 years and their families with different socioeconomic statuses to determine the prevalence of DBM at the family level and to examine the associated risk factors among the mother and child pairs in Babylon governorate. In each district, if there are no children or children with chronic diseases, we will move them to the next fifth house. The study was conducted in urban and rural areas. In Al-Hilla Center choose (al mohandessein, al akrammeen and al gamiaa) and in area rural of hilla included(Hamza Al-Dali Village, Karragol and village fzaa) in north of Babylon we choose Al-Musayyib District (almuealimin District, AL-Sajjad District) rural to Al-Musayyib we choose (Al-Jilawiyeh Village and Hor Hussein village) and Babylon hospital for women and children. This study was conducted from March 2021 to August 2021.

Sampling

The prevalence of mothers and their children in this study was 15.9%. According to Fisher formula:

$$n = \frac{z^2\, p(1-p)}{d^2}$$

Data collection tool and scoring system

This project's data were gathered through a survey of rural and urban families in Babylon governorate. A systematic questionnaire created expressly for this study was used to collect data. Aside from nutrition and dietary fatigue questionnaires, the needed information was gathered by interviewing mothers and their children after getting their consent. Prior to participating in the current study, parents gave their oral agreement, and the following data collection tools were used:

1 The questionnaire included information about: sociodemographics and variables for both mother and her child: The mother's questionnaire included (age, resident, educational level, mother employment, how many hours the mother spends doing her job, mother's age when she delivered the first child, monthly income, household members, water access); the child' questionnaire included (age, gender, vaccine, if the child is breastfeeding or not, and data on the baby's birthweight).
2 Anthropometric measurement results (height, weight, BMI) Length/Height-for-age, weight-for-age, and weight-for-height. The World Health Organization's (WHO) growth parameters were used to create groups for children younger than the age of five: as stunting (low height-for-age), wasting (low weight-for-height), and underweight (low weight-for-age); these are known as z-scores of < -2 standard deviations, whereas overweight/obesity (high weight-for-height) is defined as z-scores of > +2 standard deviations.
3 Dietary diversity in the household is a score that measures how diverse a family's HDDS Guide for measuring access to a variety of foods in the household is.[11]

The dietary diversity scores described a simple count of food groups that a household has consumed over the preceding 24 h. Due to partial recall, longer reference periods result in less accurate information. It needs to be determined whether the prior 24-h period was "ordinary"

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or "normal" for the home before utilizing this procedure. If there is a special event, such as a funeral or a feast, or if the majority of the family members are unable to attend, we will reschedule the interview. If this is not possible, we will interview a different household on a different day of the week. Each food group is assigned a score of 1 (if consumed) or 0 (if not consumed). The household score will range from 0 to 12 and is equal to the total number of food groups consumed by the household during the past 24 h: The average household dietary diversity score for the population of the study can be calculated as follows: Sum (A + B + C + D + E + F + G + H + I + J + K + L). HDDS is calculated using the following 12 dietary groups:

(A) Cereals, (B) Tubers and root, (C) Vegetables, (D) Fruits, (E) Poultry, offal, and meat, (F) Eggs, (G) Seafood and fish, (H) Pulses/beans and nuts, (I) Milk products and milk, (J) Fats and oil, (K) Honey and sugar, and (L) Miscellaneous.

Height and weight and body mass index

Height was measured in centimeters without shoes using a height plate with a horizontal head plate touching the highest point of the head. The height of the mother was measured using the tape measure.

The weight was measured in kilograms with an electronic weighing scale, for children younger than 2 years. The weight of the child was measured by removing the extra clothes. First, the mother was weighed separately and then the mother was weighed along with the child. The child's weight was computed by decreasing the mother's weight from the mother's / child's weight together. For mothers, BMI was estimated by dividing weight (kg) by height^2 (m^2).

Inclusion and exclusion criteria and limitation of the study

All mothers aged equal or younger than 15–49 years old were included and their children younger than 5 years old in the same house were included as well. Pregnant mothers, households with a dead mother, children with chronic disease, and subjects who refused to participate were excluded. The limitations included the shortness of time, the quarantine measures because of corona. The sample does not represent the whole targeted population.

Pilot study

A pilot study was conducted before starting the data collection; the prepared questionnaire was applied to 11 homes at Al Hilla to modify the questions that were not understood by parents, the time needed for data collection, and for the measurement for each child and for protocol assessment that is realistic and workable. Pilot households were excluded from the study.

Data analysis

The data were analyzed using the statistical package for the social science (SPSS) version 23. A descriptive and inferential statistical analysis using percentage and frequency tables, and Pearson's Chi-square test (χ^2) for qualitative data and t-test measures were used for continuous numerical data with $P < 0.05$, which were set for statistical significance.

Ethical consideration

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients verbal and analytical approval before sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee according to the document number 88 (including the number and the date in 14/02/2021) to get this approval.

Results

According to the results summarized in Figures 1-3 and Tables 1-3; there were 17 (11.1%) significant positive associations ($P < 0$ 042) with maternal age older than 25 years. The educational level consists of 11 (10.8%) postgraduates and 11 (8.2%) not working, as shown in Table 3.

The higher odds of families with an overweight or obese and an underweight and stunted child were statistically associated with having a second child <5 years (10 14.7%), with $P = 0.035$ compared with having only one child in the family, as shown in Table 2.

The scale shows that low DDS had a positive association 3 (100.0%) $P = 0.0001$ with a stunting child.

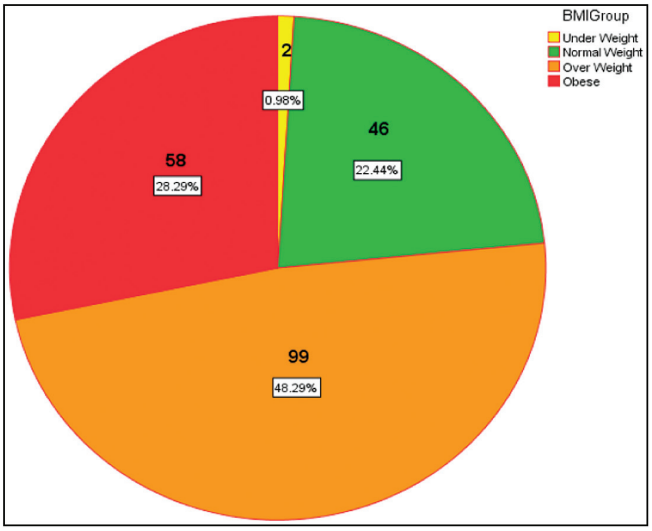

Figure 1: Prevalence of the underweight child in the sample

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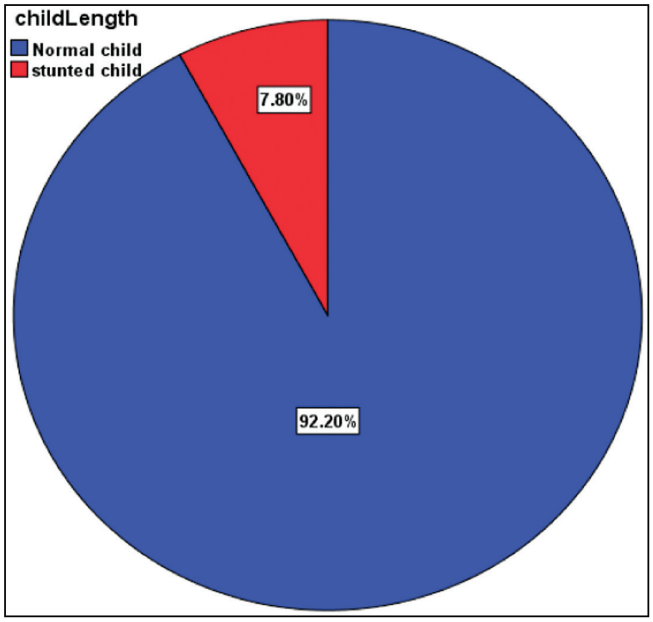

Figure 2: Prevalence of the stunted child in the sample

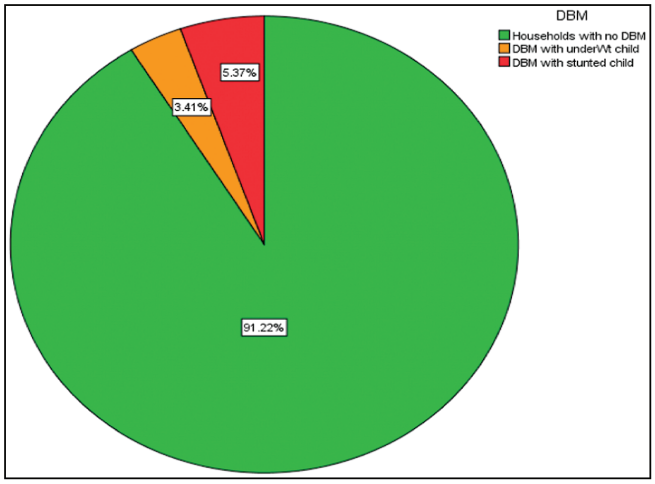

Figure 3: Prevalence of household-level mother–child with DBM in the sample

Discussion

This cross-sectional study shows that the first (although limited) survey may give an idea about the prevalence of DBM at the level of the household and its relationship with different maternal and household characteristics in Babylon governorate (Iraq).

The number of inquiring families in this study was 247 families: About 205 of these families agreed to conduct the interview, whereas the rest of the families refused to conduct the interview or to even offer their children to us. There were two key findings: First, the pooled prevalence of DBM at the household level in Babylon governorate was 8.78%. Similar to a study conducted in Bangladesh, the household prevalence of BDM was 11%.[12]

The prevalence of DBM/STC (overweight or obese mother/stunting kid) in Babylon was 5.37%, whereas Pakistan had the highest prevalence (24%) in 2017 and Bangladesh had the lowest prevalence (5%) in 2007.[13] DBM/underweight children were found to be present in 3.41% of households. According to reports from 18 countries in South Asia, Africa, and Latin America, DBM/UWC prevalence ranged from 0.3% to 5.3%.[14] Second, increased probabilities of the household DBM were linked to the mother's age (more than 25 years), the presence of a second child, and a poor diet variety score.

The maternal characteristics were associated with DBM, including an older mother. Our study showed a statistically significant positive association 17 (11.1%) ($P < 0.042$) with older maternal age (>25 years). We discovered that older mothers were more likely than younger mothers to have a higher risk of DBMHL. This is consistent with other research that demonstrates that women 30 years of age and older in Bangladesh, Myanmar, and Pakistan are overweight and obese.[15-17] Obesity grows with age among women due to a sedentary lifestyle and decreased metabolic rates.[18] Surprisingly, the research found that the education of mothers ($P = 0.604$) has no significant relationship with malnutrition in children, which may be

Table 1: Association between the presence of household and different mother characteristics (married or separated mother)

Characteristic	Group	Absent	Present	*P* Value
Maternal age	Up to 25 years	51 (98.1%)	1 (1.9%)	0.042*
	More than 25 years	136 (88.9%)	17 (11.1%)	
Marital status	Married	167 (90.3%)	18 (9.7%)	0.144
	Single	20 (100.0%)	0 (0.0%)	
Educational level	Uneducated	22 (91.7%)	2 (8.3%)	0.604
	Primary or secondary	74 (93.7%)	5 (6.3%)	
	Postgraduate	91 (89.2%)	11 (10.8%)	
Employment	Work	64 (90.1%)	7 (9.9%)	0.691
	Not work	123 (91.8%)	11 (8.2%)	

*Most significant value

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Table 2: Association between the presence of DBM and household characteristics

Characteristic	Group	Absent	Present	*P* Value
Source of water	Tap	45 88.2	6 11.8	0.385
	RO	142 92.2	12 7.8	
	Nonsterile water	0	0	
Income	Less than 500,000 (not enough)	90 91.8	8 8.2	0.938
	From 500,000 to a million (enough)	75 90.4	8 9.6	
	More than a million (enough and more)	22 91.7	2 8.3	
Presence of second child	Absent	129 94.2	8 5.8	0.035**
	Present	58 85.3	10 14.7	
Feeding scale	Low	3 100	0 0	0.845
	Medium	63 90.0	7 10.0	
	Good	187 91.2	11 8.3	
Home density	Low	31 88.6	4 11.4	0.848
	Medium	87 91.6	8 8.4	
	High	69 92.0	36 8.0	
Residence	Urban	151 91.0	15 9.0	1.00
	Rural	36 92.3	3 7.7	
Home	Own	85 89.5	10 10.5	0.412
	Rent	102 92.7	8 7.3	

**Most significant value

Table 3: Association between stunting and mother and household characteristics

Characteristic	Group	Absent	Present	*P* Value
Educational level	1	23 (95.8%)	1 (4.2%)	0.536
	2	74 (93.7%)	5 (6.3%)	
	3	92 (90.2%)	10 (9.8%)	
Employment	1	63 (88.7%)	8 (11.3%)	0.179
	2	126 (94.0%)	8 (6.0%)	
Residence	Urban	153 (92.2%)	13 (7.8%)	0.977
	Rural	36 (92.3%)	3 (7.7%)	
Homing	Own	86 (90.5%)	9 (9.5%)	0.625
	Rent	103 (93.6%)	7 (6.4%)	
Presence of second under 5y child	.00	125 (91.2%)	12 (8.8%)	0.470
	1.00	64 (94.1%)	4 (5.9%)	
scaleGp	Low	0 (0.0%)	3 (100.0%)	0.0001**
	Medium	64 (91.4%)	6 (8.6%)	
	Good	125 (94.7%)	7 (5.3%)	

**Most significant value

due to uneducated and fairly educated mothers probably obtaining good information about the nutrition of their babies through exposure to the social media and websites in addition to the wrong route via their relatives. DBM was shown to be greater in women with no education in another study in Bangladesh.[19] However, in contrast, maternal higher education was positively associated with DBMHL in Pakistan in 2018.[20] In contrast to a study in Bangladesh that found that employed mothers had a significant correlation to DBM, our research found that there was no significant relationship between whether the mother was single or married (p 0.144), and whether she was working or not with DBM. Because the mother must work outside the home to earn money, the family must rely on commercially available low-priced foods that are low in nutrients. Commercially prepared foods are usually high in energy and provide energy to adults, but they have a negative impact on children's nutritional status.[21,22]

Our research found no link between family income and DBM. However, a research in Indonesia found a link between higher household income and DBMHL.[12] However, a study in Guatemala showed DBM to be frequent among LMIC families[23,24]

Further, the presence of more children younger than the age of 5 years within the households increases the risk of both stunting and DBM, a condition that may arise with usual complications of a short time, apart from it probably

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affecting the availability of foods for children[21] and being an excuse of reduced care and attention being given to the older children in the family. On the other hand, a research in Peninsular Malaysia found that DBM was less likely to occur in families with more children.[14] This is consistent with the findings reported in underdeveloping countries, wherein having more children in the home was linked to a higher risk of DBM.[21] This is observed in families with a mother who is overweight or obese and a child who is malnourished. It could be related to a nutritional shift that causes changes in eating habits and the consumption of energy-dense foods, which, combined with a lack of physical activity, leads to excessive weight gain among mothers and other family members. Because foods with a high energy density have a low nutrient content,[13] therefore children result in consuming an unhealthy diet that leads to undernutrition.[25] As the country has experienced a shift in food preferences over the past few years, this could be a viable maternal child double burden reason for malnutrition in Babylon.

In this study, we found that there is no difference between rural and urban residence in the development, which may oppose other studies that revealed the coexistence of such DBM among urban residentials.[21,26] Such difference may be due to the shifting and urbanization of many rural areas in Iraq. An important finding in the study was the high prevalence of childhood obesity among children younger than 5 years of age, which was estimated at 76.58% in the study sample, which is surely a result of the evidence cited earlier of both nutritional transition and modernization of life in LMIC countries.[27]

The results of the study showed that three (100.0%) of the participating children had either inadequate or low diet diversity. In this study, dietary diversity was found to be a causative factor of stunting among children; these results are consistent with findings reported from other developing countries such as Burkina Faso,[28] Bangladesh,[29] Ethiopia,[30] and others.[31,32] A study in Tanzania found that dietary diversity was a protective factor against stunting and underweight among children. From the age of 12 months, the dietary diversity score was observed at our research location. This could be due to the fact that older children consume the foods prepared for the entire family and hence eat the same meals as the rest of the family. The quality of a child's food during their early years is mostly determined by the conduct and decisions of the child's moms or other primary caregivers.[33] Although assessments are challenging in many developed nations, dietary diversity is an important component for recognizing the quality of the diet. Time and resources are required for the procedures used to estimate nutritional intake. Our research sites' diets were typical of those in poorer countries: generally unbalanced, consisting primarily of carbohydrates and vegetables, with little meat products.

Conclusion

1. The prevalence of DBM, despite the small sample size, is considered significant and alarming and may be higher in larger survey studies.
2. Higher maternal age and the presence of more than one child younger than the age of 5 years were associated with increased odds of the household DBM and played crucial roles in pulling the trend of DBM upward in Babylon.

Recommendations

1. Increasing health awareness regarding the quality of food more than paying attention to its quantity. Families must know what to feed their children and not be interested in feeding them anything.
2. A larger and wider survey study is required to handle a more real picture of this problem.

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Conflicts of interest
There are no conflicts of interest.

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