Household Food Insecurity and Nutritional Status of Pre-School Children Following Relaxation of COVID-19 Restrictions

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Abstract- Studies found a high prevalence of household food insecurity (HFIS) and malnutrition and an association between them during the movement restriction period of the COVID-19 pandemic. This nutritional status should have improved by now as movement restrictions, including quarantine, have been lifted. Therefore, the goal of this cross-sectional study was to determine the current prevalence of HFIS and malnutrition and their associations and contributing factors among pre-school children (i.e., children under the age of 5 years) following relaxation of the COVID-19 restrictions in Jordan. A sample of 386 children (197 boys and 189 girls) in Irbid, Jordan, were recruited in this study following the simple random sampling method. The levels of HFIS and malnutrition were assessed using the Food Insecurity Experience Scale (FIES) and the World Health Organization (WHO) growth reference values, respectively. Relevant information were managed and measurements made and employed to calculate four major anthropometric indicators for the sample children (weight to height (WHZ), height to age (HAZ), weight to age (WAZ) and Body Mass Index to age (BMI/A) (BMI/A)). The results of analysis pointed out that prevalence of food insecurity among the sample children was 58.2%, where 19.9% of the kids were experiencing moderate food insecurity and 38.3% were suffering from severe food insecurity. On the other hand, prevalence of malnutrition among those children was 1.81%, where 1.55% of the kids were emaciated and 1.26% were severely emaciated. The results also indicated that mother's age, number of children in the family, income of the family, monthly expenses on food and beverages and the energy expenses contributed significantly ($p<0.05$) to food insecurity. Moreover, the study found that HFIS had negative correlations with WHZ ($r=-0.272$, $p=0.000$), WAZ ($r=-0.193$, $p=0.000$) and BMI/A ($r=-0.263$, $p=0.000$) and a positive correlation with HAZ ($r=0.041$, $p=0.00$). The study reports high prevalence of HFIS among children under the age of 5 years in Jordan, even after relaxation of the COVID-19 restrictions on mobility. However, prevalence of malnutrition among this group of the population is low. These results spotlight the continued impact of the COVID-19 crisis on the financial statuses of households.

Index Terms- Anthropometry, Household Food Insecurity, Jordan, Malnutrition, Pre-school children.

I. Introduction

Food insecurity is a major nutritional concern worldwide. It was frequent in low- and middle-income countries, as well as in developed countries, during the COVID-19 pandemic period [1]. Globally, the number of people impacted by hunger increased to 828 million in 2021, with an increase of around 46 million since 2020 and 150 million since outbreak of the COVID-19 pandemic [2]. According to assessment of the World Health Organization (WHO), the world will be moving further away from its objective of eradicating hunger, food insecurity and malnutrition in all forms by 2030. It had been anticipated that 22.0% (149.2 million) of the children under the age of 5 years were stunted in 2020, almost 6.7% (45.4 million) were wasting and 5.7% (38.9 million) were overweight [3]. Furthermore, it was predicted that 119 million children under the age of 5 years will be stunted in the 135 low- and middle-income nations by 2030 [4].

Food insecurity can be hazardous to people of any age, but it is especially harmful to children under the age of 5 years. Children who are food insecure may have poor health and nutritional deficiencies (UN Report, 2022) For example, inadequate nutrition

can permanently alter children's brain morphology, including motor hyperactivity, and impede their intellectual capacities, which results in poor memory and lack of attention, thus affecting the children's learning, social interaction and productivity (UN Report, 2022). Furthermore, children who are food insecure may be at higher risk of stunted growth, anaemia, asthma, oral health problems, obesity, chronic disease, depression and recurrent hospitalisation [1, 5-7]. Overall, food insecurity is associated with a lower physical quality of life and it prohibits the children from fully participating in daily activities [8]. In consequence, effective child food insecurity solutions are badly needed and they must simultaneously address the immediate food requirements of the individual homes and the underlying economic factors that contribute to local food insecurity. Therefore, determination of prevalence of food insecurity among children and identification of the factors that contribute significantly to it are of utmost importance in the efforts overcome the associated health problems and ensure good quality of life for them.

Numerous studies of food insecurity prevalence on the early stage of the COVID-19 pandemic have been conducted worldwide [9,10,11,12]. Prevalence of food insecurity among children was found to be 59.1% in Jordan (9), 17.5% in the United States of America (10), 46.9% in Peru (11) and 75.0% in Lebanon (12). Similarly, studies have been conducted to examine the relationship between HFIS and malnutrition among children during the COVID-19 pandemic time in Brazil [13], Jordan [14] and Palestine [15]. The results of these studies indicate strong association between malnutrition and HFIS. Within this context, factors such as parents' jobs, income instability, job loss, social inequality, work status and monthly income were found to be contributing to the children's low-quality diet [13-15]. However, it should be recalled that the factors that contribute to HFIS and magnitudes of their effects vary from country to another.

Worldwide, the COVID-19 restrictions were relaxed in the majority of the World countries by the end of April 2022 and people returned back to normal life style, which may have led to improvement in the food security and nutritional statuses of people, including the pre-school children, in every country. However, to the best of our knowledge, no study has ever looked into prevalence of HFIS and malnutrition and their association among pre-school children (that is, children under the age of 5 years) after relaxation of the COVID-19 restrictions. Consequently, the current study sought to determine the prevalence and association of HFIS and malnutrition among children under the age of years in Jordan and identify their determinants.

II. METHOD

A. SAMPLE AND SETTING

This cross-sectional study was implemented in Bani Kenana District in the governorate of Irbid, north of Jordan. Irbid was chosen as the study location because it has the second highest population in Jordan after Amman and the highest population density in the country. It has a population of 928,292 capita, nearly 707,420 of them reside in the city and 220,872 live in the countryside. In addition, Irbid has a high level of intra-population variability. Based on these factors, the population of Irbid was anticipated to be representative of the overall Jordanian population from various respects, particularly the socioeconomic stratification aspect. According to Jordan's Department of General Statistics (2020), Bani Kenana District is home to 18,947 boys and girls under the age of 5 years.

In the present study, the sample size was determined using Krejcie and Morgan's (1970) table, which revealed that the suitable sample size for this investigation is 386 individuals. Subsequently, one-hundred and ninety-seven boys and 189 girls were recruited. In other respects, the research data were collected by trained people to ensure that they will be collected following the same measurement tools, procedure and steps and that the questionnaire items will be understood and, hence, responded to in the right way.

B. DEMOGRAPHIC DATA

Demographic and anthropometric data on the sample children were collected, including gender, date of birth (to calculate the age in years), height in centimetres (cm) and weight in kilograms (kg). Indicators of the socioeconomic statuses of the children's parents were collected as well. These were the number of children; monthly income of the family; monthly expenses on transportation, health care and child education and other household expenses such as spending on house rent, energy, water, grocery and other miscellaneous expenditure (e.g. phone and Internet bills). These details were collected by the researchers through face-to-face interviews with the parents of the sample children. All parents provided the researchers with written Informed Consent letters to participate in this study and gave the necessary information and data.

C. HOUSEHOLD FOOD INSECURITY

The HFIS statuses of the study families were assessed using the eight questions of the Food Insecurity Experience Scale (FIES), which was validated by Elsahoryi et al. (2020). For each question, the sample child's parent was to answer by confirmation (yes) or negation (no). A panel of seven experts from different faculties in Jerash University, Jordan, were invited to examine the validity of the FIES. They were asked to assess it in terms of comprehension, content and clarity. Their feedback was received and questions were modified when due until an 80% consensus on validity of this instrument was reached. Then, the refined FIES was subjected to pilot testing to examine its reliability. Ten children in Irbid Governorate were involved in the pilot study. Food insecurity was classified into three categories: lacking (i.e. the individual is food secure) if the overall score on the FIES was ≤ 1; medium if the overall score on the FIES ranged from 2-4 and severe if the score fell in the range of 5-8. The collected data were employed in reliability analysis of this instrument according to the Alpha Model, in which the indicator of reliability is Cronbach's Alpha

Coefficient. The obtained value of this coefficient was 0.92, which indicates excellent reliability.

D. Malnutrition

Heights (cm) and weights (kg) of the sample children were measured with a tape measure and a weighing machine, respectively, by a trained dietitian. The growth reference software application of the WHO was used to categorize the children's WAZ, WHZ and HAZ values. The nutritional status of each kid was recorded in one of the four reference growth categories of the WHO: (i) stunting, (ii) wasting, (iii) underweight and (iv) overweight. The BMI was calculated by dividing the child's weight (kg) by her/his squared height (m2). Then, the cut-off points of the BMI that have been established by the WHO were used.

E. Statistical analysis

The research data were subjected to descriptive statistical analysis that included cross-tabulations and calculations of frequencies and percentages in the effort to study prevalence of food insecurity in the different demographic groups. Additionally, the Chi-squared test was used to examine associations, if any, of food insecurity with the demographic characteristics of the parents of the sample children. The relationships of food insecurity with the children's anthropometric indicators (WHZ, HAZ and WAZ) were explored using Pearson's correlation analysis.

III. Results

A. Demographic characteristics

Table 1 shows that 41.5% (n=160) of the sample children were one-year old or younger and that 33.4% (n=129) ranged in age from one year to three years while 25.1% (n=97) were ranging in age from three to five years. On the other hand, Table 2 summarizes the demographic characteristics of the families of the sample children, including the parents' ages, number of children in the family, total family income and details of the family's monthly expenses.

Table 1: Distribution of the sample pre-school children among the age groups

Age group	***N***	***(%)***
≤1 Year	*160*	*41.5*
1-<3 Years	*129*	*33.4*
3-5 Years	*97*	*25.1*
	386	***100.0***

B. Food insecurity

Table 3 presents the results of analysis of HFIS. It uncovers that 41.7% (n=161) of the sample families were enjoying food security, about 19.9% (n=77) were at an average level of food insecurity and 38.3% (n=148) were suffering from severe food insecurity.

Association of food insecurity with the demographic characteristics of the children parents was analysed using the Chi-squared test of independence. The results (Table 4) unfold that food insecurity was significantly associated with mother's age (p=0.000), number of children in the family (p=0.006), total monthly income of the family (p=0.000), the monthly expenditure on food and beverages (p=0.001) and the monthly spending on water and electricity (p=0.005). On the other hand, food insecurity had no statistically-significant associations with the father's age (p=0.222) and the monthly expenditures on the household daily needs (p=0.620), house rent (p=0.133), public transportation and owned transportation means (p=0.637), health care (p=0.208), children's education (p=0.276), loans (p=0.075) and other things like phone and Internet bills (p=0.090.

A. Malnutrition

Table 5 unveils that the percentages of normal children were, in general, appreciable, ranging from one-fourth to one-third of the sample children. They were 29.0% for children aging 3 year or less and 22.0% for children ranging in age from 3 to 5 years. The percentages of severely-wasted, wasted, obese and overweight children were found to be extremely low; < 1.0%, except for the proportion of obese children aging 1 year or less, which was 2.33% (Table 5). The proportions of overweight children are noteworthy, but decreasing with age. Almost 2.33% of the children aging 1 year or less were overweight. The percentages were 3.89% and 1.55% for children in the two, next age group, respectively. However, the various proportions listed in Table 5 and presented in this paragraph and the three subsequent paragraphs should be interpreted with caution, bearing in mind that the percentages of children of the three age classes in the study sample, from younger to older, were 41.45%, 33.42% and 25.13%, respectively, and that the percentages provided in Table 5 have been calculated relative to the whole sample (N=386), that is, they are intra-group percentages. The inter-group percentages will, hence, be much higher than those reported in Table 5.

With respect to BMI/A, Table 5 uncovers that the percentages of severely-wasted, wasted, obese and overweight children were really low; < 1.0%, except the proportion of obese children aging 1 year or less, which was 1.55%. The percentages of normal children were, generally, appreciable, ranging from almost one-fifth to one-third of the sample children. They were 30.8% for children aging 1 year or less, about 28.2% for children ranging in age from 1 year to 3 years and 22.8% for children who are older than 3 years but not older than 5 years. For the three age categories under study from younger to older group, the percentages of children with possible risk of overweight were 8.03%, 4.15% and 1.55%, respectively (Table 5). These figures support that risk of overweight decreases with age within this group of children.

Regarding WAZ, Table 5 brings to light that the percentages of underweight and severe underweight children were very small; < 1.0%. Normal children, however, were high in proportions among the three age classes considered, constituting one-fourth to one-third of the sample children.

Table 2: Demographic characteristics of parents of the sample pre-school children

Variable	Range	N	(%)
Father's age	18 – 25	29	7.5
	26 – 36	272	70.5
	≥37	85	22.0
Mother's age	18 – 25	102	26.4
	26 – 36	254	65.8
	37 – 47	30	7.8
Number of children	1 – 3	320	82.9
	4 – 6	66	17.1
Total monthly income of the family	1 – 299	35	9.1
	300 – 599	257	66.6
	600 – 899	74	19.2
	≥900	20	5.2
Expenditure on food and beverage	1 – 149	229	59.3
	150 – 299	125	32.4
	≥300	29	7.5
Spending on household needs	1 – 199	328	85.0
	≥200	55	14.2
Expending on house rent	1 – 149	252	65.3
	≥150	44	11.4
Expenditure on bills (water, electricity, etc.)	1 – 49	287	74.4
	≥50	94	24.4
Spending on public transportation and owned transportation	1 – 49	177	45.9
	50 – 99	125	32.4
	100 – 149	60	15.5
	≥150	18	4.7
Expending on healthcare expenses	1 – 49	33	8.5
	≥50	24	6.2
Spending on children's education	1 – 49	141	36.5
	50 – 99	53	13.7
	100 – 149	15th	3.9
	≥150	7	1.8
Expenditure on a loan or bank debt	1 – 99	44	11.4
	100 – 199	105	27.2
	200 – 299	40	10.4
	≥300	9	2.3
Other expenses	1 – 49	33	8.5
	50 – 99	25	6.5
	≥100	12	3.1

In specific, almost 35.5% of the children aging 1 year or lower were normal. The percentages of normal children in the other two age groups, from younger to older, were 29.27% and 24.61%, respectively (Table 5). The results of analysis also uncover that the proportion of pre-school children with high weight decreases with age. It was 5.18% among children whose age is 1 year or less and 4.15% among children older than 1 year but not older than 3 years. In the case of the children who were older than 3 years but not older than 5 years, the percentage is negligible; 0.26% (Table 5). As to HAZ, the outcomes of statistical analysis underline that the percentages of the sample children who were severely stunted and those who were very tall were remarkably low; <1.0% (Table 5). The same is true in the case of stunted children, except the younger of them (≤1 years), whose proportion was 1.81%, which is still small proportion. As such, almost all sample pre-school children (97.15% (Table 5)) were normal in height. Furthermore, it is observed in Table 5 that the proportions of children in all growth categories decrease with age within this group of the population, namely, the pre-school children.

Table 3: Levels of household food security of the sample members

Food insecurity level	N	%
Security	161	41.7
Average	77	19.9
Intense	148	38.3
	386	**100**

B. Correlations between food insecurity and anthropometric measures

Correlation analysis (Table 6) unveiled significant correlations between food insecurity and each of the four anthropometric measures under consideration, namely, WHZ, HAZ, WAZ and BMI/A. It had statistically-significant, negative correlations with WHZ (r=–0.272, p=0.000), BMI/A (r=–0.263, p=0.000) and WAZ (r=–0.193, p=0.000). In the meantime, it had statistically-significant, positive relationship with HAZ (r=–0.041, p=0.000). These correlations suggest that the higher the food insecurity, the higher the HAZ and the lower the WHZ, WAZ and BMI/A.

IV. Discussion

This study found that 41.7% of the sample pre-school children were enjoying food security whereas 38.3% were suffering from severe food insecurity and 19.9% were moderately food insecure. These levels of food insecurity are consistent with the findings of earlier studies of food insecurity among children in Jordan and other countries during the COVID-19 lockdown and mobility restriction period. As an example, Elsahoryi et al. (2020) reported that prevalence of food security among Jordanian children was 40.1% while prevalence of moderate food insecurity was 36.1% and that of severe food insecurity was 23.1%. Similarly, Bilbesi et al. (2022) reported that 21.5% of Palestinian children were severely food insecure and 36.2% were food secure [15]. It is worth noting that food insecurity among Jordanian children now is 58.1% compared to 59.2% in 2020 and that food security is still

Table 4: Association of food insecurity with parents' demographic characteristics

Variable	Category	Average	Intense	Total	χ^2	*p*
Father's age	18 – 25	1.30%	2.60%	7.50%	5.711	0.222
	26 – 36	13.50%	25.60%	70.50%		
	≥37	5.20%	10.10%	22.00%		
mother's age	18 – 25	4.90%	7.80%	26.40%	*21,871	**0**
	26 – 36	11.70%	26.90%	65.80%		
	37 – 47	3.40%	3.60%	7.80%		
Number of children	1 – 3	16.60%	29.00%	82.90%	*10.311	**0.006**
	4 – 6	3.40%	9.30%	17.10%		
The total monthly income of the family	1 – 299	1.00%	6.00%	9.10%	*30,765	**0**
	300 – 599	16.80%	24.60%	66.60%		
	600 – 899	1.60%	6.50%	19.20%		
	≥900	0.50%	1.30%	5.20%		
Expenditure on food and beverage	1 – 149	13.30%	26.60%	59.80%	*18.262	**0.001**
	150 – 299	5.70%	9.10%	32.60%		
	≥300	0.80%	2.60%	7.60%		
Spending on household needs	1 – 199	17.20%	33.40%	85.60%	0.955	0.62
	≥200	2.90%	4.70%	14.40%		
Expending on house rent	1 – 149	18.90%	28.70%	85.10%	4.037	0.133
	≥150	1.40%	6.10%	14.90%		
Expenditure on bills (water, electricity, etc.)	1 – 49	14.40%	26.00%	75.30%	*10.432	**0.005**
	≥50	5.80%	12.10%	24.70%		
Spending on public and owned transportation	1 – 49	11.30%	16.80%	46.60%	4.292	0.637
	50 – 99	5.80%	12.90%	32.90%		
	100 – 149	2.10%	6.60%	15.80%		
	≥150	0.80%	1.80%	4.70%		
Expending on healthcare expenses	1 – 49	15.80%	26.30%	57.90%	3.139	0.208
	≥50	7.00%	14.00%	42.10%		
Expenditure on children's education	1 – 49	12.50%	29.60%	65.30%	7.509	0.276
	50 – 99	7.40%	9.70%	24.50%		
	100 – 149	0.90%	4.60%	6.90%		
	≥150	0.50%	0.90%	3.20%		
Spending on a loan or bank debt	1 – 99	7.10%	7.60%	22.20%	11,451	0.075
	100 – 199	7.10%	22.70%	53.00%		
	200 – 299	1.50%	10.60%	20.20%		
	≥300	1.00%	2.00%	4.50%		
Other expenses	1 – 49		31.40%	47.10%	8.051	0.09
	50 – 99	5.70%	18.60%	35.70%		
	≥100	4.30%	7.10%	17.10%		

Table 5: Major anthropometric indicators as a function of age of the sample pre-school children*

Age (y)	WHZ_CAT					
	Severe Thinness	**Thinness**	**Normal**	**Possible risk of over weight**	**Over weight**	**Obesity**
	Severely wasted	**Wasted**	**Normal**	**Possible risk of over weight**	**Over weight**	**Obese**
≤1	0.00	0.52	29.02	9.33	2.33	0.26
1-<3	0.26	0.00	29.02	3.89	0.26	0.00
3-5	0.26	0.26	22.80	1.55	0.26	0.00
Overall average	**0.52**	**0.78**	**80.83**	**14.77**	**2.85**	**0.26**
	BMI/A _CAT					
	Severe Thinness	***Thinness***	***Natural***	***Possible risk of weight gain***	***Over weight***	***Obesity***
	Severely wasted	***Wasted***	***Normal***	***Possible risk of overweight***	***Over weight***	***Obese***
≤1	*0.00*	*0.52*	*30.83*	*8.03*	*1.55*	*0.52*
1-<3	*0.26*	*0.52*	*28.24*	*4.15*	*0.00*	*0.26*
3-5	*0.00*	*0.52*	*22.80*	*1.55*	*0.26*	*0.00*
Overall average	***0.26***	***1.55***	***81.87***	***13.73***	***1.81***	***0.78***
	WAZ_CAT				***Total***	
	Severe weight loss	***Weight loss***	***Natural***	***High***		
	Severe under weight	***Under weight***	***Normal***	***High***		
≤1	*0.00%*	*0.78%*	*35.49%*	*5.18%*	***41.45%***	
1-<3	*0.00%*	*0.00%*	*29.27%*	*4.15%*	***33.42%***	
3-5	*0.26%*	*0.00%*	*24.61%*	*0.26%*	***25.13%***	
Overall average	***0.26%***	***0.78%***	***89.38%***	***9.59%***	***100.00 %***	
	HAZ_CAT				***Total***	
	Severe dwarfism	***Stunting***	***Natural***	***Long***		
	Severely stunted	***Stunted***	***Normal***	***Very tall***		
≤1	*0.78%*	*1.81%*	*38.86%*	*0.00%*	***41.45%***	
1-<3	*0.00%*	*0.00%*	*33.16%*	*0.26%*	***33.42%***	
3-5	*0.00%*	*0.00%*	*25.13%*	*0.00%*	***25.13%***	
Overall average	***0.78%***	***1.81%***	***97.15%***	***0.26%***	***100.00 %***	

at the same level even after relaxation of the COVID-19 restrictions. We expected that the food insecurity status of the study population improved due to relaxation of the COVID-19 quarantines and movement restrictions and resumption of the normal life style. But the results of this study spotlight limited

improvement in the food security status of pre-school children, even after relaxation of the COVID-19 restrictions.

Table 6: Pearson's coefficients of correlation of food insecurity with four major anthropometric indicators

Variable		*r*	*p*
Food insecurity	Weight to height (WHZ)	-.272**	0.000
	Height to age (HAZ)	0.041*	0.000
	Weight to age (WAZ)	-0.193**	0.000
	Body Mass Index to age (BMI/A)	-0.263**	0.000

* Significant at the 0.05 level of significance
** Significant at the 0.01 level of significance

Our findings demonstrate that a number of factors contribute significantly to the food security status of the children, which encircle mother's age (p=0.000), the number of children in the family (p=0.006), family's income (p=0.000), monthly expenditure of the family on food and drink (p=0.001) and energy costs (p=0.005). This result accords with results of past research. For instance, studies revealed that it is easy for a family to get food, either in terms of quality or quantity, if it has a high income [14, 16, 17]. A low family income may make it difficult to feed the family members properly [16]. However, Chan et al. (2020) found no connection between family income and the level of food security in households; as a result, researchers were driven to look into additional potential risk variables that may contribute to people's food insecurity [19, 20]. In keeping with this, we examined further how these factors contributed to food insecurity; we believe that contribution may be ascribed to the inflation in the country. The inflation rate in Jordan was 0.4% in 2020 and became 3.8% in 2022, which, corresponds to an inflation rate increase of nearly 10 times, which is too high. Because of this inflation, the prices of commodities like food, beverages and energy rose without a proportional increase in incomes of families. This may have contributed to the severe food insecurity in the study population, even after relaxation of the COVID-19 restrictions and resumption of the normal way of life.

In contrast to the case of food insecurity, this study reports very low percentages of emaciation (1.55%), severe emaciation (0.26%), stunting (1.81%) and severe stunting (0.78%) in the study population compared to the corresponding percentages reported in earlier literature. Further, our study found statistically-significant (p=0.000), negative correlations between food insecurity among the sample children and WHZ (r=–0.272), HAZ (r=–0.193) and BMI/A (r=–0.263). Meantime, this study found that there is positive correlation between food insecurity and HAZ (r=0.041). The WHO (2019) reported that prevalence of stunting among Jordanian children under the age of 5 years was 7.8% while that of wasting was 2.4% [18]. The results of this study illustrate that the percentages of stunting and wasting among the study population decreased despite the higher prevalence of food insecurity. AbuKishk et al. (2021) reported a stunting prevalence of 22.0% among Palestinian refugee children residing in two refugee camps in Jordan. These findings suggest that further studies are needed to find out why these differences in food security prevalence exist between Jordanian children and refuges in Jordan. However, these differences may be attributed to the fact that the refugees do not have Jordanian citizenship status and, consequently, their access to the social services which the citizens access readily is limited [14]. Similar food insecurity results were reported for Palestinian refugees in Lebanon, who suffer from the effects of civic and occupational limitations. In addition, mothers mentioned using an adaptive, cost-saving tactic by picking items that were of inferior quality and, thus, not expensive. The limited consumption of meat, fruits and vegetables by Palestinian refugee children in Lebanon [22] and people of other low- to middle-income nations has also been noted [23].

V. Strengths and Limitations

This cross-sectional study presents the current status of HFIS and the nutritional status of pre-school children in Irbid, Jordan, and identifies their determinant factors following relaxation of the restrictions on mobility associated with the COVID-19 pandemic. A limitation of this study is that it was conducted in the governorate of Irbid only. In consequence, the findings may not be readily generalizable to pre-school children and their families in other governorates in Jordan. Additionally, we employed a refined version of the FIES. Validity and reliability of this version of the FIES may need to be tested when it is used with different populations.

VI. Conclusion

Our study sheds light on the current prevalence of HFIS and malnutrition among pre-school Jordanian children and identifies their contributing factors following relaxation of the COVID-19 restrictions on mobility. The results show that a high prevalence of severe food insecurity still exists in children younger in age than 5 years in Jordan, even after relaxation of the COVID-19 pandemic restrictions, where the percentages of HFIS and malnutrition among this group of the population are somehow similar to the corresponding percentages during the lockdown period of the COVID-19 pandemic. However, very low percentages of the study population were emaciated and underweight or having stunted growth, which reflect much improvement over the case during the COVID-19 pandemic restrictions time. Furthermore, the results of this study suggest that the policy makers may pay further attention in future policies to the current status of HFIS and its contributing factors and to its impact on the nutritional status and health of children.

In the light of its findings, this study recommends implementation of educational programs for pregnant women in the health centres on their nutrition and nutrition of their children in order to raise their awareness of the best nutritional practices that contribute to normal growth of children. The study also recommends periodic anthropometric examination of children starting from birth so as to track their growth and detect any malnutrition at an early time.

In addition, we recommend implementation of similar studies of children under the age of 5 years across the governorates of Jordan. Similar investigations of children of other age categories too are recommended.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1) El Bilbeisi AH, Al-Jawaldeh A, Albelbeisi A, Abuzerr S, Elmadfa I and Nasreddine L (2022) Households' Food Insecurity and Their Association With Dietary Intakes, Nutrition-Related Knowledge, Attitudes and Practices Among Under-five Children in Gaza Strip, Palestine. Front. Public Health 10:808700. doi: 10.3389/fpubh.2022.808700
2) Levels and trends in child malnutrition: UNICEF/WHO/The World Bank Group joint child malnutrition estimates: key findings of the 2021 edition.
3) Organization WH. Levels and Trends in Child Malnutrition: UNICEF. World Health Organisation (2021).
4) Argaw A, Hanley-Cook G, De Cock N, Kolsteren P, Huybregts L, Lachat C. Drivers of under-five stunting trend in 14 low-and middle-income countries since the turn of the millennium: a multilevel pooled analysis of 50 demographic and health surveys. Nutrients. (2019) 11:2485. doi: 10.3390/nu111 02485.
5) Ke J, Ford-Jones EL. Food insecurity and hunger: A review of the effects on children's health and behaviour. Paediatr Child Health. (2015) 20:89– 91. doi: 10.1093/pch/20.2.89
6) Fleegler EW, Frank DA, Brett-Fleegler MB. Food insecurity: hidden problems. Real remedies. In: Social Emergency Medicine. Germany: Springer (2021). p. 217–33.
7) Chilton M, Chyatte M, Breaux J. The negative effects of poverty & food insecurity on child development. Indian J Med Res. (2007) 126:262.
8) Gundersen C, Ziliak JP. Food insecurity and health outcomes. Health Aff. (2015) 34:1830–9. doi: 10.1377/hlthaff.2015.0645.
9) Elsahoryi N, Al-Sayyed H, Odeh M, McGrattan A, Hammad F. Effect of Covid-19 on food security: A cross-sectional survey. Clin Nutr. 2020;40:171-178. doi: 10.1016/j.clnesp.2020.09.026..
10) Parekh, N., Ali, S.H., O'Connor, J. et al. Food insecurity among households with children during the COVID-19 pandemic: results from a study among social media users across the United States. Nutr J 20, 73 (2021). https://doi.org/10.1186/s12937-021-00732-2.
11) Reine Gedeon, Souheil Hallit, Lara Hanna Wakim, Food insecurity and eating habits of Lebanese children aged 5–11years during the COVID-19 pandemic and the socioeconomic crisis: a national study. BMC Public Health (2022) 22:1982 https://doi.org/10.1186/s12889-022-14387-z
12) : Pradeilles, R., Pareja, R., Creed- Kanashiro, H. M., Griffiths, P., Holdsworth, M., Verdezoto, N., Eymard-Duvernay, S., Landais, E., Stanley, M., & Rousham, E. K. (2022). Diet and food insecurity among mothers, infants, and young children in Peru before and during COVID-19: A panel survey. Maternal & Child Nutrition, 18, e13343. https://doi.org/10.1111/mcn.13343.
13) Ribeiro-Silva RC, Pereira M, Aragão É, Guimarães JMM, Ferreira AJF, Rocha AS, Silva NJ, Teixeira CSS, Falcão IR, Paixao ES and Barreto ML (2021) COVID-19, Food Insecurity and Malnutrition: A Multiple Burden for Brazil. Front. Nutr. 8:751715. doi: 10.3389/fnut.2021.751715
14) AbuKishk N, Gilbert H, Seita A, et al. Under-five malnutrition among Palestine refugee children living in camps in Jordan: a mixed-methods study. BMJ Global Health 2021;6:e005577. doi:10.1136/ bmjgh-2021-005577
15) El Bilbeisi AH, Al-Jawaldeh A, Albelbeisi A, Abuzerr S, Elmadfa I, Nasreddine L. Households' Food Insecurity and Its Association with Demographic and Socioeconomic Factors in Gaza Strip, Palestine: A Cross-Sectional Study. Ethiop J Health Sci. 2022 Mar;32(2):369-380. doi: 10.4314/ejhs.v32i2.18.
16) Mohamadpour M, Sharif ZM, Keysami MA. Food insecurity, health and nutritional status among sample of palm-plantation households in Malaysia. Journal of health, population, and nutrition. 2012; 30:291
17) McKay FH, Haines BC, Dunn M. Measuring and understanding food insecurity in Australia: A systematic review. International Households' Food Insecurity… Abdel H. E.B. et al. 379 journal of environmental research and public health. 2019; 16:476.
18) Mei CF, Faller EM, Chuan LX, San Gabriel J. Household Income, Food Insecurity and Nutritional Status of Migrant Workers in Klang Valley, Malaysia. Annals of Global Health. 2020; 86.
19) Wirth C, Strochlic R, Getz C. Hunger in the fields: food insecurity among farmworkers in Fresno County. California Institute for Rural Studies. 2007; 13:1-30.
20) Nord M, Brent CP. Food insecurity in higher income households: US Department of Agriculture, Economic Research Service; 2002.
21) World Health Organization. Regional Office for the Eastern Mediterranean. (2019). Strategy on nutrition for the Eastern Mediterranean Region 2020–2030. World Health Organization. Regional Ofce for the Eastern Mediterranean. https://apps.who.int/iris/handle/10665/330059.
22) Jamaluddine Z, Sahyoun NR, Choufani J, et al. Child-Reported food insecurity is negatively associated with household food security, socioeconomic status, diet diversity, and school performance among children attending un relief and works agency for Palestine refugees schools in Lebanon. J Nutr 2019;149:2228–35
23) Webb MF, Chary AN, De Vries TT, et al. Exploring mechanisms of food insecurity in Indigenous agricultural communities in Guatemala: a mixed methods study. BMC Nutr 2016;2.
24) UN Report FAO, IFAD, UNICEF, WFP and WHO. 2022. The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. https://doi.org/10.4060/cc0639en.
25) Krejcie RV & Morgan DW (1970). Determining sample size for research activities, Educ Psychol Meas 30(3):607-610.

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