

Malnutrition in Children Under 5 Years: Impact of COVID-19

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Received: March 23, 2021; **Published:** August 16, 2021

Abstract

The already fragile health system in the Gaza Strip which is permanently overburdened with many disabling factors has been further victimized with the Covid-19 pandemic. The term double burden was not enough to describe the devastating condition and deterioration that had been drastically affecting all life aspects in the Gaza Strip.

This event has urged Ard El-Insan Palestinian Benevolent Association (AEI) to propose a fact sheet addressing such a peculiar issue within child health, nutrition, early detection and intervention of child's developmental delay, care of coeliac disease that are the areas of specialty of this association since 1984. Within this context, AEI was also affected as some staff were affected with Corona virus infection, a matter that caused temporary understaffing in addition to shortages of protective tools against Covid-19 virus. Many reasons contributed also to disrupted work performance including the closing down of certain areas when declared highly risky by the Ministry of Health (MOH) and Ministry of Interior (MOI). This procedure has minimized arrival of staff and beneficiaries living in these areas. Another factor was the procedures followed in AEI in which it was necessary to impose absolute adherence to instructions and preventive measures that necessitate changing the pattern of work and ensuring spacing between cases and receiving a limited number of patients to curb infection with Covid-19 virus.

One of the most prominent disorders was also the impaired response of medical and nutritional management of sick malnourished children. Poverty has played a major role in disabling regular arrival of people for follow up visits because of inability to afford the transportation cost. Others were not able to secure the necessary food or micronutrient supplements or dry food rations if not provided by AEI.

All the above reasons have worked adversely on service provision and hindered the actual achievement of prevention and management of acute severe and moderate malnutrition, anaemia and the accompanying common childhood illness. The cure rates slowed and the recovery period lengthened from all the diseases for which great efforts were made to treat them.

Keywords: Malnutrition; Children; COVID-19

Introduction

On 11 March 2020, COVID-19 was declared a pandemic by the World Health Organization (WHO) [1]. In addition to clinical presentation, COVID-19 imposes preventive measures such as quarantine and travel restrictions to contain the outbreak [2]. Although the impact

of the pandemic would vary from country to country, poverty and inequality would most certainly increase globally [3]. In Palestine, on 5 March 2020, Palestinian Prime Minister declared a state of emergency to contain the COVID-19 outbreak after 7 cases were confirmed in Bethlehem “Palestinian City in West Bank”. The state of emergency has included all Palestinian Territories including Gaza Strip as it closed educational institutions, restricted movement, and banned public gatherings, to ensure social distancing [4].

Two years before, in May 2018, based on the Palestinian Central Bureau of Statistics (PCBS) and United Nation Office for the Coordination of Humanitarian Affairs (OCHA), there is an increase in the poverty rate in Gaza Strip from 38.8% in 2011 to 53% by the end of 2017, which is the equivalent to around 1.01 million people, including over 400,000 children [5]. Later on, the unemployment rate in Gaza Strip is three times higher than in the West Bank in the first quarter of 2020. Using the latest revised International Labour Organization (ILO) standards ICLS-19th, the unemployment rate in Gaza Strip was 46% compared with 14% in the West Bank, while the unemployment rate for males in Palestine was 21% compared with 40% for females [6].

Currently, the greatest burden on the health care system is due to poverty following the growing and alarming COVID-19 outbreak (<https://corona.ps/>). This situation is overlapped with the fragile healthcare system, widely spread of vulnerable groups, political crises and governmental financial crises. The mostly ignored groups in the healthcare systems and those affected by malnutrition in Gaza Strip are children and mothers [7]. Therefore, without urgent and adequate healthcare responses (by all sectors including Ministry of Health, UNRWA and non-governmental organizations), people’s suffering will escalate and their health will jeopardize for years to come.

Malnutrition

Child undernutrition remains a serious health problem in developing countries where it is still a public health challenge [8]. Acute malnutrition is associated with increased risks of morbidity and mortality [9]. Malnourished children, particularly those with severe acute malnutrition (SAM), have a higher risk of death from common childhood illness such as diarrhea and pneumonia. Nutrition-related factors contribute to about 45% of deaths in children under-5 years of age [10]. However, treatment services were estimated to reach less than 15% of undernourished children [11]. The correlation between malnutrition and infections may be partly caused by poverty confounding, which is the determinant of both; malnutrition increases the susceptibility to infection while infections aggravate malnutrition through decreased appetite, catabolism and increased nutrient demand [12]. Figure 1 adapted from Rytter, *et al.* (2014) [12] has shown the conceptual framework on the relationship between malnutrition, infections and poverty. In addition, it sheds light into the factors that related to poverty and the outcomes of all factors which is the mortality.

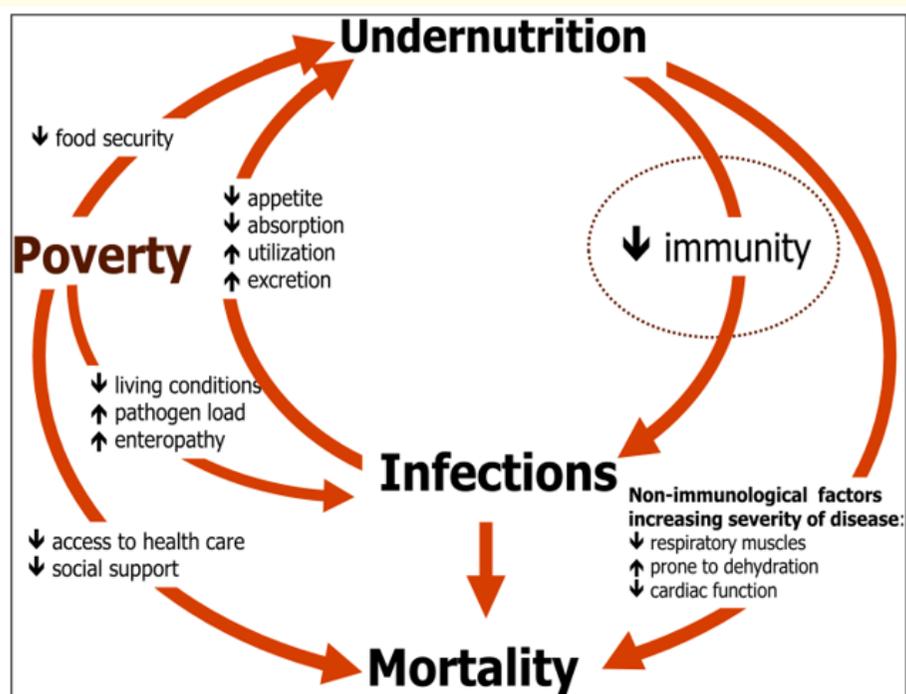


Figure 1: Framework on the relationship between malnutrition, infections and poverty [12].

To encounter childhood malnutrition, effective interventions are urgently needed. The introduction of the community-based management of acute malnutrition model including the use of ready-to-use therapeutic foods, made the treatment of acute malnutrition more accessible and convenient to beneficiaries [13], whereas, cash-based interventions increasingly implemented in emergencies and in developing contexts to alleviate poverty and food insecurity in vulnerable households [14].

Group at risk

The global mortality rate for under-5 has decreased by 59%, from 93 deaths per 1,000 live births in 1990 to 39 deaths per 1,000 live births in 2018. This is equivalent to 1 in 11 children dying before reaching age 5 in 1990, compared to 1 in 26 in 2018. More than half of children under-5 dies from diseases which can be avoided and treated with easy and effective intervention. Strengthening health systems will save many young lives [10].

Definitions of malnutrition

This fact sheet applies to childhood malnutrition in the sense of undernutrition. Undernutrition resulted from insufficient intake of energy foods (carbohydrates and fats), proteins, and micronutrients (vitamins and minerals) [12]. The clinical representation of energy and protein deficiency is responsible for marasmus and/or kwashiorkor. WHO guidelines subsume these entities into the blanket term “severe acute malnutrition (SAM)” and its variants with or without medical complications [13].

Acute malnutrition results from hunger or disease, or both, and is associated with rapid weight loss or failure to gain weight. Deficiencies of vitamin A, iron, iodine, and zinc are common micronutrient deficiencies seen in undernourished children. Table 1 adapted from Ghosh-Jerath, *et al.* (2017) [15] displays the forms of undernutrition in children aged 6 - 59 months. Other definitions of malnutrition include intrauterine growth and obesity, which are not covered by this fact sheet.

Form of Undernutrition	Manifestations
Subclinical undernutrition	<ul style="list-style-type: none"> Underweight: can be acute or chronic, measured as weight-for-age Stunting: chronic undernutrition, measured as height-for-age Wasting: Acute undernutrition, measured as weight-for-height
Moderate acute malnutrition (MAM)	<ul style="list-style-type: none"> Low weight-for-height/length (<-2 to ≥-3 standard deviations [Z-scores] of median WHO child growth standard) or Mid-upper arm circumference (MUAC) of 115 - 125 mm and No edema Child should have an appetite and be alert and clinically well
Severe acute malnutrition (SAM)	<ul style="list-style-type: none"> Very low weight-for-height/length (<-3 standard deviations [Z-scores] of median WHO child growth standard) or Mid-upper arm circumference (MUAC) < 115 mm or Bilateral pitting edema

Table 1: Forms of undernutrition in children aged 6 - 59 months.

Risk factors and causes of malnutrition

Undernutrition is a medical as well as a social disorder. The insufficient dietary intake or infection, or disease affecting the child, may be directly related to undernutrition. Lack of sanitation and hygiene, inadequate care, economic deprivation, and food insecurity are contributory factors. Social, cultural, political, and legal factors influencing access to and use of resources contribute further to undernutrition of children [15]. So, any interventions must address these factors as well. Figure 2 shows the framework adapted from the WHO (2017) [16] and built by the UNICEF. It describes the causes of impaired growth and development in three overlapped levels: child, household, and community or nation factors. This multisectoral framework is embracing food, health and caring practices.

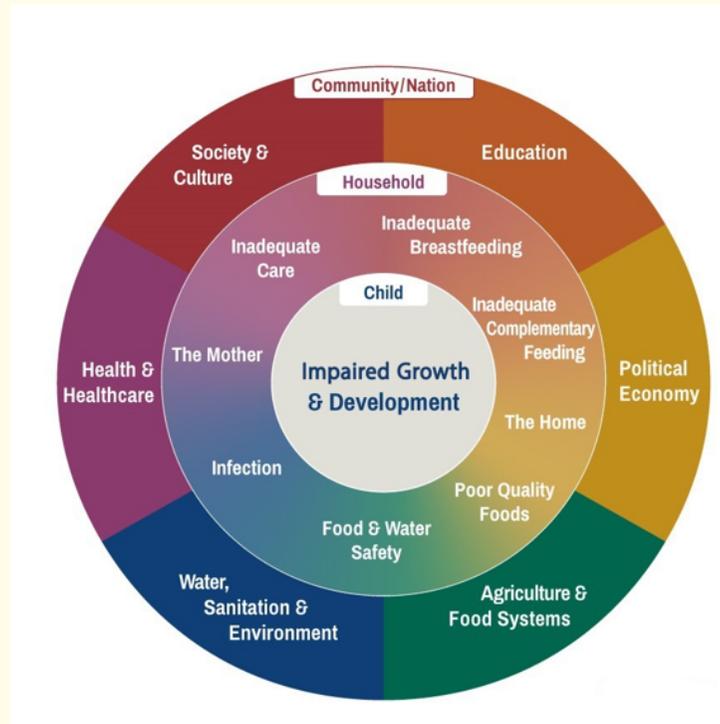


Figure 2: Framework of childhood stunted growth and development [16].

Anthropometry and screening criteria

Summarized from ENN (2011) [17], this fact sheet provides an overview of how acute malnutrition can be measured in individuals in emergencies. There are four methods to assess an individual’s nutritional status; anthropometry, biochemical assessment, clinical assessment and dietary intake. Anthropometry is the method most commonly used in emergencies, in combination with clinical assessment of visible wasting and bilateral edema.

Measuring malnutrition in infants younger than 6 months

- Usually, they are not measured anthropometrically (assessment of birth-weight does not reflect acute malnutrition).

- Admission into selective feeding has relied primarily on clinical signs (e.g. edema, visible wasting, too weak to suckle, not gaining weight despite feeding).

Measuring malnutrition in children 6 - 59 months

A child that is suffering from SAM may be both severely wasted and stunted. In emergencies, the main focus is on wasting, due to its link to morbidity and mortality. Interestingly, one individual can be classified with more than one form of growth failure at the same time. The followings are key terms of malnutrition:

- **Weight-for-height:** A measure of wasting or acute malnutrition.
- **Height-for-age:** A measure of stunting or chronic undernutrition.
- **Weight-for-age:** A measure of underweight or wasting and stunting combined.
- **MUAC:** A measure of wasting or acute malnutrition.

Double burden of malnutrition (DBM)

Compared with well-nourished children, children with MAM have a three-fold increased risk of mortality and impaired physical and cognitive development. Children with SAM have a nine-fold increased risk of mortality [15]. Based on published data, childhood malnutrition correlated strongly with the disability-adjusted life years (DALYs), which is the total of years of life lost as a result of premature death plus years of life lived with disability. One DALY corresponds to one lost year of healthy life. The DALY is also an important indicator in comparing the effectiveness and cost-effectiveness of different interventions and the resource investment required in preventing and treating different diseases [18].

Through rapid global nutrition transition, an increasing proportion of individuals are exposed to different forms of malnutrition during the life course and have the double burden of malnutrition (DBM) directly. Life-course exposure to early undernutrition (encompasses stunting and infectious diseases) followed by later overweight, by imposing a high metabolic load on a depleted capacity for homeostasis, and in women increases the risk of childbirth complications [19]. Therefore, the long term consequences include cognitive deficits, poor school performance, poor motor development, compromised productivity, and high incidence of non-communicable diseases, as well as higher medical expenses [20].

The context of Palestine

This section involved two subheadings: the first is food and nutrition insecurity, and the second is a collection of some research that implemented in Palestinian Territories and related to malnutrition.

Food and nutrition insecurity

Prior to the outbreak of COVID-19, nearly one third of the population “32.7% or 1.6 million people” could not afford nutritious food [21]. This results from high unemployment, low household incomes and a high cost of living. Although food is available, it is priced out of reach for many. Numerous households are food insecure even though they already receive food and other assistance [22]. Based on a 2018 survey, over 1.2 million people in Gaza, or 62.2% of households, were identified as moderately or severely food insecure, compared with 53.3% in 2014. In contrast, food insecurity in the West Bank decreased to 9.2%, down from 11.8% in 2014 [23].

Food security is defined as the availability and the access of food to all people; whereas nutrition security demands the intake of a wide range of foods which provides the essential needed nutrients, i.e., vitamins, minerals, protein, and energy contents [24]. Nutrition security is a somewhat broader concept than food security. To achieve nutrition security, individuals need more than just access to sufficient, safe, and nutritious food. They must also have safe water and adequate sanitation; the ability to access health care services; and knowledge of sound household and community practices in child care, food storage and preparation, and hygiene [25]. So, nutrition insecurity can present as various forms of malnutrition.

Review of some malnutrition researches (among children)

Table 2 shows the results of some studies that performed in Palestinian Territories (West Bank and Gaza Strip) across 18 years from 2000 to 2018. The reviewed studies have discussed malnutrition among children under 5 years. Malnutrition was presented in different forms including overweight, underweight, wasting, stunting, iron deficiency anemia, zinc deficiency, vitamin A deficiency, folate intake, expected vitamin B12 deficiency (data from adults) and dental caries. Different studies found malnutrition is more prevalent and more severe in Gaza strip compared to West Bank, as well as the prevalence has been risen and worsen over years.

Author(s)	Year of Data collection	Region(s)	Main Outcomes
Azzam., <i>et al.</i> (2019) [26]	2018	Gaza Strip	<ul style="list-style-type: none"> Children aged 6-24 months. 22.0% were underweight (10.7% moderate; 11.3% severe) 22.6% were stunted (9.3% moderate; 13.3% severe) 21.3% were wasted (13.3% moderate; 8.0% severe)
Humphris and Abuhaloob (2014) [27]	2014	Gaza Strip (Refugees)	<ul style="list-style-type: none"> High prevalence of triple burden in children (overweight due to high macronutrients food content, malnutrition due to low micronutrients food content, and dental caries)
El Kishawi., <i>et al.</i> (2016) [28]	2012	Gaza Strip	<ul style="list-style-type: none"> The prevalence of the dual form of malnutrition (Mother and her Child) in the Gaza Strip was 15.7%. Malnutrition is more prevalent in camps rather than cities.
Ghattas., <i>et al.</i> (2017) [29]	2010	West Bank, Gaza Strip	<ul style="list-style-type: none"> Stunting: 10.1% for children aged 6-24 months Double burden (stunting and overweight): 1.9%.
Tsigga and Grammatikopoulou (2013) [30]	1998 – 2007	West Bank, Gaza Strip, East Jerusalem	<ul style="list-style-type: none"> Palestinian preschool children (Pooled analysis) 44.0% of the children suffered from iron deficiency anemia 4.0% suffered from wasting 4.7% were underweight 10.9% were stunted Palestinian preschool children (Sensitivity analysis) 39.5% of the children suffered from iron deficiency anemia 2.9% suffered from wasting 3.9% were underweight 10.5% were stunted

Troen., <i>et al.</i> (2006) [31]	2003	Palestinian Territories	<ul style="list-style-type: none"> • 55% of Palestinians were food insecure • > 30% at risk for food insecurity
			<ul style="list-style-type: none"> • MARAM project: overall prevalence of vitamin A deficiency in children aged 12 to 60 months was of 21.8%. • 26.6% in the Gaza Strip and 18.6% in the West Bank.
			<ul style="list-style-type: none"> • MARAM Project: more than half of children from 1 to 3 years old and more than three-quarters of children 4 and 5 years old were deficient in daily folate intake.
			<ul style="list-style-type: none"> • Low dietary zinc intake was documented in nutritional assessments of the West Bank and Gaza Strip
			<ul style="list-style-type: none"> • Evidence of low vitamin B12 levels among adult populations throughout the region suggests low vitamin B12 intake in all age groups.
Abdeen., <i>et al.</i> (2007) [32]	2002 – 2003	West Bank, Gaza Strip	<ul style="list-style-type: none"> • Children 6 to 59 months of age • 3.1% in the West Bank and 3.9% in the Gaza Strip were suffering from acute malnutrition. • Chronic malnutrition was 9.2% in the West Bank and 12.7% in the Gaza Strip • Infants 6 to 23 months of age were significantly at risk acute malnutrition
Qouta and Odeh (2005) [33]	2000	West Bank, Gaza Strip	<ul style="list-style-type: none"> • 37.9% of children were anemic (33.5% in the West Bank and 38.7% in the Gaza Strip). • 2.5% of children suffered from acute malnutrition (2.9% in the West Bank and 2.0% in the Gaza Strip) • 9.0% from chronic malnutrition (8.0% in the West Bank and 10.5% in the Gaza Strip).

Table 2: Review of public health and nutrition researches among children in Palestine.

Ard El Insan (AEI) data

The obtained data for admission of children under age of 5 years have been divided into two periods of time. The first period is from October 01, 2019 to February 29, 2020, while the second period is from March 01, 2020 to July 31, 2020. The first period of time is considered the period before COVID-19 declaration in Palestinian Territories, while the second period of time is considered the period after COVID-19 declaration. The data were collected from the two healthcare centers that follow AEI, namely, Gaza City Centre (Address: An-Naser District) and Khan-Younis City Centre (Address: Al-Amal District). Data were analyzed using SPSS software (v 22.0; IBM Corporation, Armonk, NY, USA).

Time period: October 01, 2019 to February 29, 2020

Table 3 shows the description of some social factors (5 months before COVID-19 declaration) that might influence the nutritional status for all admitted children in both AEI centres, namely, Gaza (covered three governorates: Middle, Gaza and North Gaza) and Khan-Younis (covered two governorates: Khan-Younis and Rafah).

No.		Gaza City Centre (N = 1466)		Khan-Younis City Centre (N = 1079)	
		%	No.	%	No.
Refugees	Yes (Refugee)	667	45.5	1044	96.7
	No (Non-refugee)	799	54.5	35	3.3
Gender	Male	761	51.9	550	51.0
	Female	705	48.1	529	49.0
Father's Education*	Illiterate and very low	164	11.2	11	1.0
	Low education	562	38.3	47	4.4
	Moderate education	443	30.2	27	2.5
	High education	189	12.9	15	1.4
	Not specified	108	7.4	979	90.7
Mother's Education*	Illiterate and very low	52	3.5	4	0.4
	Low education	560	38.2	37	3.4
	Moderate education	529	36.1	33	3.1
	High education	221	15.1	25	2.3
	Not specified	104	7.1	980	90.8

Table 3: Description of social factors (5 months before COVID-19 declaration).

*: Illiterate and very low: ≤ 6 years education; Low education: 7 - 11 years education; Moderate education: ≥12 years + 2 years diploma; High education: 4 years diploma, Bachelor or postgraduate education.

Table 4 describes the indicators of malnutrition in both AEI centres. The indicators of malnutrition are anemia, underweight measurement, wasting and stunting. Every indicator has been classified into four categories: mild, moderate, severe and normal. Additionally, it describes the states of malnutrition in two monitoring times: first visit (around first of October 2019) and last visit (around the end of February 2020).

Gaza City Centre N = 1466 No.		First Visit		Last Visit	
		%	No.	%	No.
Anemia	Mild	213	14.5	440	30.0
	Moderate	1068	72.8	805	54.9
	Severe	19	1.3	11	0.8
	Normal	108	7.4	144	9.8
	Not Specified	58	4.0	66	4.5
Underweight	Mild	354	24.1	473	32.2
	Moderate	327	22.3	194	13.2
	Severe	93	6.3	58	4.0
	Normal	692	47.3	741	50.6
Wasting	Mild	346	23.6	332	21.9
	Moderate	167	11.4	74	5.1
	Severe	33	2.2	20	1.4
	Normal	920	62.8	1050	71.6

Stunting	Mild	549	31.3	473	32.2
	Moderate	264	18.0	297	20.2
	Severe	108	7.4	105	7.3
	Normal	635	43.3	591	40.3
Khan-Younis City Centre		First Visit		Last Visit	
N = 1079		%	No.	%	
No.					
Anemia	Mild	205	19.0	311	28.9
	Moderate	750	69.5	475	44.0
	Severe	8	0.7	5	0.4
	Normal	106	9.9	281	26.1
	Not Specified	10	0.9	7	0.6
Underweight	Mild	208	19.3	319	29.6
	Moderate	182	16.9	55	5.1
	Severe	55	5.1	14	1.3
	Normal	634	58.7	691	64.0
Wasting	Mild	209	19.4	191	17.8
	Moderate	91	8.4	22	2.0
	Severe	12	1.1	5	0.4
	Normal	757	70.2	844	78.2
	Not Specified	10	0.9	17	1.6
Stunting	Mild	324	30.0	332	30.7
	Moderate	159	14.7	153	14.2
	Severe	113	10.6	61	5.6
	Normal	483	44.7	553	49.5

Table 4: Description of malnutrition indicators (5 months before COVID-19 declaration).

Time period: March 01, 2020 to July 31, 2020

Table 5 shows the description of some social factors (5 months after COVID-19 declaration) that might influence the nutritional status for all admitted children in both AEI centres, namely, Gaza (covered three governorates: Middle, Gaza and North Gaza) and Khan-Younis (covered two governorates: Khan-Younis and Rafah).

No.		Gaza City Centre		Khan-Younis City Centre	
		(N = 1503)		(N = 1386)	
		%	No.	%	
Refugees	Yes (Refugee)	370	24.6	1322	95.4
	No (Non-refugee)	1133	75.4	64	4.6
Gender	Male	793	52.7	729	52.6
	Female	710	47.3	657	47.4

Father's Education*	Illiterate and very low	182	12.1	5	0.4
	Low education	516	34.3	15	1.1
	Moderate education	493	32.8	5	0.4
	High education	204	13.6	2	0.1
	Not specified	108	7.2	1359	98.0
Mother's Education*	Illiterate and very low	54	3.6	4	0.3
	Low education	503	33.5	20	1.5
	Moderate education	588	39.1	3	0.2
	High education	250	16.6	--	--
	Not specified	108	7.2	1359	98.0

Table 5: Description of social factors (5 months after COVID-19 declaration).

*: Illiterate and very low: ≤6 years education; Low education: 7 - 11 years education; Moderate education: ≥ 12 years + 2 years diploma; High education: 4 years diploma, Bachelor or postgraduate education.

Table 6 describes the indicators of malnutrition in both AEI centres. The indicators of malnutrition are anemia, underweight measurement, wasting and stunting. Every indicator has been classified into four categories: mild, moderate, severe and normal. Additionally, it describes the states of malnutrition in two monitoring times: first visit (around first of March 2020) and last visit (around the end of July 2020).

Gaza City Centre N = 1503 No.		First Visit		Last Visit	
		%	No.	%	No.
Anemia	Mild	295	19.7	340	22.6
	Moderate	927	61.6	836	55.6
	Severe	23	1.5	19	1.3
	Normal	98	6.5	102	6.8
	Not Specified	160	10.7	206	13.7
Underweight	Mild	450	29.9	470	31.3
	Moderate	365	24.3	346	23.0
	Severe	128	8.5	109	7.2
	Normal	560	37.3	578	38.5
Wasting	Mild	406	27.0	434	28.9
	Moderate	215	14.4	160	10.6
	Severe	23	1.5	16	1.1
	Normal	853	56.7	889	59.1
	Not Specified	6	0.4	4	0.3
Stunting	Mild	489	32.5	509	33.8
	Moderate	315	20.9	326	21.7
	Severe	139	9.3	137	9.2
	Normal	560	37.3	531	35.3

Khan-Younis City Centre N = 1386 No.		First Visit		Last Visit	
		%	No.	%	No.
Anemia	Mild	480	34.6	501	36.1
	Moderate	766	55.3	555	40.0
	Severe	8	0.6	5	0.4
	Normal	119	8.6	304	21.9
	Not Specified	13	0.9	21	1.5
Underweight	Mild	278	20.1	368	26.5
	Moderate	254	18.3	159	11.5
	Severe	50	3.6	35	2.5
	Normal	804	58.0	824	59.5
Wasting	Mild	301	21.8	378	27.3
	Moderate	179	12.9	101	7.3
	Severe	32	2.3	23	1.7
	Normal	861	62.1	862	62.1
	Not Specified	13	0.9	22	1.6
Stunting	Mild	323	23.3	319	23.0
	Moderate	199	14.3	161	11.6
	Severe	77	5.6	73	5.3
	Normal	787	56.8	833	60.1

Table 6: Description of malnutrition indicators (5 months after COVID-19 declaration).

Impact of COVID-19 on malnutrition indicators (Gaza City Centre)

This fact sheet has been intended to identify impact of COVID-19 outbreak on malnutrition indicators in children aged less than 5 years. Table 7 displays the effect of nutritional intervention (encompasses antibiotics, deworming, oral rehydration salt, oral micronutrients and fortified foods) on malnutrition indicators including anemia, underweight measurements, wasting and stunting. The data have been collected 5 months before and 5 months after COVID-19 declaration. The majority of admitted children in the funded projects had one or more malnutrition indicators. The following is change of malnutrition indicators:

No.		Before COVID-19 (N = 1466)		After COVID-19 (N = 1503)	
		%	No.	%	No.
Anemia	Deteriorated	238	16.2	65	4.3
	Improved	534	36.5	135	9.0
	Recovered	144	9.8	102	6.8
	Same	550	37.5	1201	79.9
Underweight	Deteriorated	22	1.5	31	2.1
	Improved	29	2.0	27	1.8
	Recovered	181	12.3	59	3.9
	Same	201	13.7	397	26.4
	Normal case	1033	70.5	989	65.8

Wasting	Deteriorated	32	2.2	15	1.0
	Improved	6	0.4	11	0.7
	Recovered	132	9.0	73	4.9
	Same	57	3.9	155	10.3
	Normal case	1239	84.5	1249	83.1
Stunting	Deteriorated	106	7.2	46	3.1
	Improved	23	1.6	18	1.2
	Recovered	56	3.8	21	1.4
	Same	273	18.6	399	26.5
	Normal case	1008	68.8	1019	67.8

Table 7: Change of malnutrition status around COVID-19 declaration in Gaza City Centre.

- **Anemia:** Although the percentage of deteriorated cases has been lowered from 16.2% before COVID-19 declaration to 4.3% after COVID-19 declaration, the percentage of improved cases and recovered cases have been reduced from 36.5% to 9.0% and from 9.8% to 6.8%, respectively.
- **Underweight:** The percentage of deteriorated cases has been increased from 1.5% before COVID-19 declaration to 2.1% after COVID-19 declaration, and the percentages of improved cases and recovered cases have been reduced from 2.0% to 1.8% and from 12.3% to 3.9%, respectively.
- **Wasting:** Although the percentage of deteriorated cases has been lowered from 2.2% before COVID-19 declaration to 1.0% after COVID-19 declaration, the percentage of improved cases has been slightly improved from 0.4% to 0.7%, and the percentage of recovered cases has adversely affected as reduced from 9.0% to 4.9%.
- **Stunting:** Although the percentage of deteriorated cases has been lowered from 7.2% before COVID-19 declaration to 3.1% after COVID-19 declaration, the percentage of improved cases and recovered cases have been reduced from 1.6% to 1.2% and from 3.8% to 1.4%, respectively.

Impact of COVID-19 on malnutrition indicators (Khan-Younis City Centre)

Table 8 displays the effect of nutritional intervention (encompasses antibiotics, deworming, oral rehydration salt, oral micronutrients and fortified foods) on malnutrition indicators including anemia, underweight measurements, wasting and stunting. The data have been collected 5 months before and 5 months after COVID-19 declaration. The majority of admitted children in the funded projects had one or more malnutrition indicators. The following is change of malnutrition indicators:

No.		Before COVID-19 (N = 1079)		After COVID-19 (N = 1386)	
		%	No.	%	No.
Anemia	Deteriorated	98	9.1	53	3.8
	Improved	336	31.1	300	21.6
	Recovered	281	26.0	304	21.9
	Same	364	33.8	729	52.7

Underweight	Deteriorated	7	0.6	12	0.9
	Improved	11	1.0	13	0.9
	Recovered	174	16.2	119	8.6
	Same	51	4.7	169	12.2
	Normal case	836	77.5	1073	77.4
Wasting	Deteriorated	13	1.2	17	1.2
	Improved	9	0.8	9	0.6
	Recovered	81	7.5	95	6.9
	Same	22	2.0	120	8.6
	Normal case	954	88.5	1145	82.7
Stunting	Deteriorated	29	2.7	23	1.7
	Improved	49	4.5	12	0.9
	Recovered	82	7.6	55	4.0
	Same	136	12.6	199	14.3
	Normal case	783	72.6	1097	79.1

Table 8: Change of malnutrition status around COVID-19 declaration in Khan-Younis City Centre.

- **Anemia:** Although the percentage of deteriorated cases has been lowered from 9.1% before COVID-19 declaration to 3.8% after COVID-19 declaration, the percentage of improved cases and recovered cases have been reduced from 31.1% to 21.6% and from 26.0% to 21.9%, respectively.
- **Underweight:** The percentage of deteriorated cases has been increased from 0.6% before COVID-19 declaration to 0.9% after COVID-19 declaration, and the percentage of improved cases has been reduced slightly from 1.0% to 0.9%, while the percentage of recovered cases has been reduced from 16.2% to 8.6%.
- **Wasting:** The percentage of deteriorated cases does not change after COVID-19 declaration. However, the percentages of improved and recovered cases have changed negatively from 0.8% to 0.6% and from 7.5% to 6.9%.
- **Stunting:** Although the percentage of deteriorated cases has been lowered from 2.7% before COVID-19 declaration to 1.7% after COVID-19 declaration, the percentage of improved cases and recovered cases have been reduced from 4.5% to 0.9% and from 7.6% to 4.0%, respectively.

Conclusion

Poverty is escalating in the Gaza Strip and unemployment is becoming a real threat. The risk of malnutrition in vulnerable groups, especially children under 5 years of age, has increased. There are several donors who support AEI initiatives to improve malnutrition among children less than 5 years of age, not least UNICEF, Save the Children International (SCI), Muslim Aid, Medical Aid for Palestinians (MAP) and Dan Church Aid (DCA). With the continuing emergency in the Gaza Strip, the food and nutrition security have reached rate of warning to all population groups, and the outbreak of COVID-19 make it more serious.

According to AEI, malnutrition, including anemia, underweight, wasting and stunting affects children of lower educated parents more frequently but is also affecting children of higher educated parents as well. Both genders have clearly been malnourished and there is

little gap in the indicators of malnutrition between refugees and non-refugees. For all types of malnutrition, there is a comparable proportion between the period previous to declaration COVID-19 (October 01, 2019 to February 29, 2020) and the period following declaration COVID-19 (March 01, 2020 to July 31, 2020). In both AEI centres, the higher reported proportions of admitted cases are moderate to mild cases, whereas the severe cases are not trivial and cannot be neglected.

Although, the follow-up has included medical and nutritional intervention, the worst scenario comes from COVID-19 outbreak is the decreased percentages of improvement and recovering cases, and increased the percentages of deteriorated cases after 5 months of follow-up, compared to what previously determined before COVID-19 declaration. The amelioration of cases has been greatly affected by the social distancing and protective measures of COVID-19, which reduces the general incomes accompanied by governmental financial crises and nutrition insecurity. Finally, COVID-19 outbreak is an emergency situation; it may end or get worse, still, the malnutrition indicators expected to escalate and the impact may continue for years to come. It is worthy noted that AEI centres cover the five governorates in Gaza Strip; Gaza City Centre concerned to three governorates, namely, North Gaza, Gaza and Middle governorate, whereas, Khan-Younis City Centre concerned to two governorates, namely, Khan-Younis and Rafah.

Acknowledgment

This Fact Sheet prepared by: Dr. Mohammed S. Ellulu (Al-Azhar University of Gaza) and reviewed by: Dr. Adnan Al Wahaidi (Ard El Insan Palestinian Association) as a part of the project titled “improving access to adequate health and nutritional care services for children under five and women in access restricted areas of Gaza Strip”, which funded by the United Nations Occupied Palestinian Territory Humanitarian Fund (oPt HF).

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Volume 10 Issue 9 September 2021

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