



## Health Problems Among Preschool Children Attending Two Health Centers In Mansoura, Egypt

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### ABSTRACT

**Background:** Preschool children are among the most vulnerable segment of society, suffering from high rates of illnesses. **Objective:** to provide up-to date estimation of the prevalence of common health problems among preschool children. Additionally, to define the sociodemographic predictors of these health problems. **Method:** A descriptive cross-sectional study with analytic component conducted among preschool children who were attending two health centres in Mansoura, Egypt. A semi-structured interview questionnaire was designed to collect data. Additional physical examination & laboratory investigations were performed. **Results:** A total 400 studied children were included. Mean age was 31.1±12.4 months and 54.2% were males. The main health problems were parasitic infestations (58.5%), dental problems (51.8%), anaemia (31.5%), overweight/obesity (25.8%), and underweight for age (23.8%). Predictors of anaemia included age from 12 to <24 months (OR=30.5), mixed and artificial feeding (OR=60.0 & 33.0, respectively), parasitic infestations (OR=14.4) and underweight for age (OR=30.0). Predictors of obesity included age from 48 to 60 months (OR=4.5) and mixed feeding (OR=1.25). Predictors of underweight included age groups <48 months (OR=1.05-1.048), artificial and breast feeding (OR=54.3 & 30.98, respectively). Predictors of parasitic infestations; rural residence (OR=1.51), artificial feeding (OR=17.3). Predictors of dental problems included only NICU admission (OR=2.71). **Conclusions:** Parasitic infestations, dental problems, overweight/obesity, anaemia and underweight for age are most common health problems among preschool children. Parents should be encouraged to attend regular check-ups of their children including dental examination. Visits should focus on nutritional education, iron supplementation, personal hygiene, and vaccination.

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### INTRODUCTION

Preschool children are defined as children aged 1 to 5 years old. This is a critical time in one's life because this age is associated with rapid growth and development. Growing children are nutritionally fragile, and as future citizens of the country, their health determines the nation's strength and pride.<sup>1</sup> Many factors affect children in this critical age, water cleanliness and air pollution are two environmental aims and indicators that are important to this group.<sup>2</sup> Inadequate nutrition has also been identified as a risk

factor for the development of diseases that impact children's growth and development.<sup>3</sup> The ARIs are widely prevalent and they are the greatest cause of high morbidity and mortality in children under the age of five, as well as the most common reason for seeking medical help around the world. ARIs account for 30–50% of pediatric medical consultations and 20–40% of pediatric hospitalizations. Poverty, limited family finances, low parental education, lack of

breastfeeding, and malnutrition are all risk factors for respiratory infections.<sup>4</sup>

Childhood diarrhea is very wide and is a prominent cause of death in children, accounting for around 8% of all deaths among children under the age of 5 years worldwide in 2017. Despite the availability of simple effective treatment, about 1,300 young children die every day, or over 480,000 children every year. The majority of diarrhea deaths occur in children under the age of two in South Asia and Sub-Saharan Africa. In Egypt; Seasonally adjusted diarrhea incidence was 3.6 episodes per child under five years of age per year with a minimum estimate of 30 million cases annually in Egypt.<sup>5</sup> The overall annual number of children under the age of five who died from diarrhea was reduced by 60%. Many more children could be spared if simple measures were implemented.<sup>5</sup>

Iron deficiency anemia is the most common type of anemia that is linked to impaired cognitive and neurologic function, with long-term health and economic implications. Hookworms, schistosomiasis, and other infestations are common in underdeveloped countries and can have a severe impact on children's nutritional health and growth. In several African countries, studies have revealed a link between the presence and density of infection and chronic malnutrition, anemia, and impaired cognition.<sup>6</sup>

Oral health is an aspect of overall health because the oral cavity is regarded a gateway to the body. Caries in young children is a worldwide public health issue. The frequency of early childhood caries has been estimated between 6.8 and 12 % in England and 11–53.1 % in the United States, the prevalence of dental caries was significant in maxillary front teeth. Early childhood prevalence was reported to be 44 % in India among children aged 8 to 48 months. Periodontal diseases and gingivitis are dangerous infections that can lead to tooth loss if left untreated.<sup>7</sup>

Unintentional injuries are a leading cause of death and morbidity in children, accounting for about 875,000 deaths per year around the world. Every year, one million children die because of injuries and violence, according to the World Health Organization (WHO). Almost half of all injuries in preschool children occur at home.<sup>8</sup> This study was conducted to provide up-to-date data about the common health problems affecting the preschool children with the following objectives; estimation of the prevalence of health problems

among preschool children and assess relation of sociodemographic characteristics of the children to frequency of these health problems.

Research question: what are the most common health problems among preschool children?

## METHOD

A descriptive cross-sectional study with analytic component conducted on a total of 400 preschool children who attending two health centers in Mansoura district, General Health Center in Mansoura city and family medicine center in Mahlet Dmnah over the period from 2019 to 2021. The units were purposively selected as they are more accessible, with higher flow rate and more cooperation.

Children aged from 1-5 years attending studied health centers for routine care, vaccination, or complaining of acute or chronic disease. Inclusion criteria included children aged from 1-5 years while exclusion criteria included children with cancer, type I diabetes, and bleeding disorders.

The calculated sample size was calculated using one proportion formula.<sup>9</sup> Assuming a frequency of 47%<sup>10</sup> with two-sided confidence limits of 5%, 383 patients would be required, using 80% power level and 95% two-sided significance level. The sample size was increased to 400 participants to compensate for dropouts or protocol failures with incomplete data.

A predesigned semi-structured pre-tested interview questionnaire was designed and used to collect data including: Socio-demographic characteristics such as age, parent's education, occupation, residence, income and housing status, detailed present history of any health problem, its onset, course, duration, recurrence, detailed past history of similar health problem or another one, detailed risk factors of this health problem. Weight, height, body mass index (BMI), hemoglobin level, stool examination by Zinc sulfate floatation method with Scotch tape preparation for detection of pinworms and urine examination by visual examination, dipstick test and microscopic examination. For assessment of child's weight; child was asked to step up backwards onto the scale and stand still over the center of the scale with body weight evenly distributed between both feet, child's arms were hanging freely by the sides of the body, with palms facing the thighs, hold his/her

**Table (1): Distribution of child-related variables in the studied children.**

Child-related variables	Studied children (n = 400) N (%)
<b>Age (months):</b>	
12.0-	163 (40.8)
24.0-	54 (13.5)
36.0-	144 (36.0)
48.0-60	39 (9.8)
<b>Sex:</b>	
Male	217 (54.2)
Female	183 (45.8)
<b>Number of siblings:</b>	
No	54 (13.5)
<3	231 (57.8)
≥3	115 (28.8)
<b>Child order:</b>	
First	207 (51.8)
Middle	184 (46.8)
Last	9 (2.2)
<b>Mode of delivery:</b>	
CS	250 (62.5)
VD	150 (37.5)
<b>NICU admission:</b>	
Yes	44 (11.0)
No	356 (89.0)
<b>Type of feeding in the first year of life:</b>	
- Mixed	230 (57.5)
- Artificial feeding	110 (27.5)
- Breast Feeding	60 (15.0)
<b>History of food allergy:</b>	
- Strawberries	5 (1.2)
- Dairy products	19 (4.7)
- Chocolate	3 (0.7)
- Mango	2 (0.5)
- Fish	4 (1.0)

head up, and face forward. For the measurement of standing height, the child was asked to stand with his/her back against the board & back, scapulae, and buttocks are in contact with the vertical board. Anemia was diagnosed at hemoglobin level (<11 g/dl) as suggested by WHO,<sup>11</sup> Weight was assessed and plotted to growth chart of the studied children with children < 5<sup>th</sup> percentile was considered underweight, 85<sup>th</sup>-95<sup>th</sup>

percentiles were considered overweight and ≥95<sup>th</sup> percentile were considered obese.<sup>12</sup>

**Data Analysis:** Data was entered and statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Qualitative data were described as numbers and percentages. Chi-Square and Monte Carlo tests were used for comparison between groups. Binary stepwise logistic regression analysis was used for prediction of independent variables of health problems. Significant predictors in the univariate analysis were entered into the regression model. Odds ratios and their 95% confidence interval were calculated. “*p*value ≤0.05” was considered to be statistically significant in the univariate and multivariate analysis.

## RESULTS

The present study was conducted on 400 preschool children with mean age 31.05±12.42 months ranging from 12 to 60 months; 40.8% of the studied children aged from 12 to less than 24 months, 36% of them aged from 36 to less than 48 months, 54.2% were males, 57.8% of them had less than 3 siblings, and 52% were first child. In addition, 62.5% of the studied children were delivered by CS section and 11% were admitted to NICU. As regards feeding in the first year of life, 57.5% had mixed breast feeding, 27.5% had artificial feeding and 15% were breast feeding. Food allergy was reported among 8.2% of the studied children as shown in Table (1). Of the studied children; 81% were attending for vaccination and routine care, 16% acute health problems (e.g., upper and lower respiratory tract infection, diarrhea, otitis media) and 3% chronic health problems including bronchial asthma and skin allergy (figure 1).

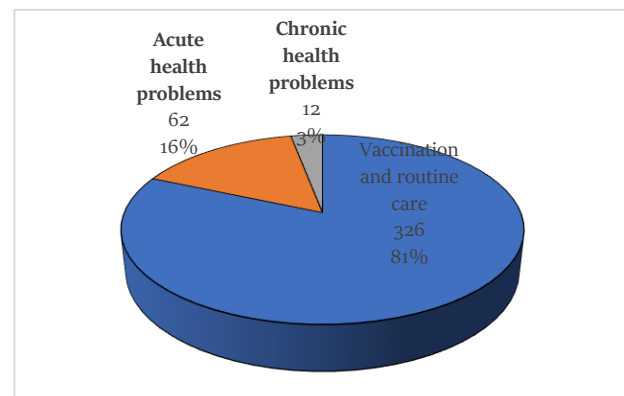
The main health problems were parasitic infestations (58.5%), dental problems (51.8%), anemia (31.5%), overweight/obesity (25.8%), and underweight for age (23.8%), as shown in figure (2). Parasitic infestations (58.5%) included Amoeba, Oxyuris, and Giardia, A statistically significant relation was detected between prevalence of anemia (31.5%) among studied children and the following; young age (from 12 to less than 24 months) and artificial feeding and underweight for age. For cases with parasitic infestations; 47.9% have anemia with statistically significant association. A statistically significant

**Table (2): Relation between child-related variables and prevalence of health problems among studied children.**

	Anemic N=126 (31.5%)	Parasitic infestations N=234 (58.5%)	Overweight/Obesity N=103 (25.8%)	Underweight for age N=95 (23.8%)	Dental problems N=207 (51.8%)
<b>Age (months)</b>					
12.0-	117 (71.8)	126 (77.3)	29 (17.8)	86 (52.8)	0
24.0-	4 (7.4)	25 (46.3)	20 (37)	3 (5.6)	30 (55.6)
36.0-	2 (1.4)	66 (45.8)	33 (22.9)	4 (2.8)	138 (95.8)
48.0-60	3 (7.7)	17 (43.6)	21 (53.8)	2 (5.1)	39 (100)
P-value	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Sex</b>					
Male	66(30.4)	138(63.6)	56(25.8)	53(24.4)	112(51.6)
Female	60(32.8)	96(52.5)	47(25.7)	42(23.0)	95(51.9)
P-value		0.024	0.978	0.730	0.952
<b>Child order</b>					
First	63 (30.4)	130 (62.8)	52 (25.1)	54 (26.1)	110 (53.1)
Middle	60 (32.6)	98 (53.3)	47 (25.5)	41 (22.3)	93 (50.5)
Last	3 (33.3)	6 (66.7)	4 (44.4)	0	4 (44.4)
P-value	0.892	0.142	0.429	0.162	0.795
<b>Number of siblings:</b>					
No	13 (24.1)	53 (98.1)	16 (29.6)	10 (18.5)	32 (59.3)
<3	77 (33.3)	113 (48.9)	55 (23.8)	60 (26.0)	115 (49.8)
≥3	36 (31.3)	68 (59.1)	32 (27.8)	25 (21.7)	60 (52.2)
P-value	0.419	<0.001	0.566	0.427	0.453

relation between prevalence of parasitic infestations (66.7% Amoeba, 23.1% Oxyuris , 10.2% Giardia) among studied children and the following; young age (from 12 to less than 24 months), male sex, having sisters and daughters more than or equal to 3, rural residence and artificial feeding. Similarly, a statistically significant relation between prevalence of overweight/obesity among studied children and the following; older age (from 48 to 60 months) and infants with mixed feeding as show in table (2 and 3). Underweight for age among studied children was significantly associated with the following; younger age (from 12 to less than 24 months) and infants with artificial feeding during their first year of life. Dental problems were found to be significantly associated with; older age (from 48 to 60 months), infants admitted to NICU, infants with mixed feeding and those without food allergy as shown in table (2). Multivariate analysis of the significant risk factors for anemia detected the following as predictors; infants aged from 12 to less than 24 months (OR=30.52), mixed and artificial feeding (OR=60 & 33 respectively), parasitic infestations (OR=14.3) and

underweight for age (OR=30) with the overall percent



**Figure (1): Reasons for attending health center** predicted was 93.5% (as shown in table 4). Predictors of overweight/ obesity were; infants aged from 48 to 60 months (OR=4.5), and mixed feeding (OR=1.25) with overall percent predicted was 74.2% (as shown in table 2). Predictors of underweight among studied children were; infants aged from 12 to >24, aged from 24 to <36, from 36 to <48 months (OR=1.05, 1.03 & 1.048, respectively), artificial and breast feeding (OR=54.3 & 30.98, respectively) with

**Table (2) Cont'n: Relation between child-related variables and prevalence of health problems among studied children.**

	Anemic N=126 (31.5%)	Parasitic infestations N=234 (58.5%)	Overweight/Obesity N=103 (25.8%)	Underweight for age N=95 (23.8%)	Dental problems N=207 (51.8%)
<b>Father education:</b>					
Illiterate	21 (36.8)	34 (59.6)	13 (22.8)	17 (29.8)	27 (47.4)
Primary or preparatory	36 (27.3)	76 (57.6)	38 (28.8)	29 (22)	69 (52.3)
Secondary	33 (33)	61 (61)	28 (28.0)	23 (23)	55 (55.0)
University or more	36 (32.4)	63 (56.8)	24 (21.6)	26 (23.4)	56 (50.5)
P-value	0.573	0.925	0.542	0.699	0.813
<b>Mother education:</b>					
Illiterate	23 (27.4)	44 (52.4)	26 (31)	20 (23.8)	45 (53.6)
Primary or preparatory	36 (30.8)	73 (62.4)	25 (21.4)	26 (22.2)	58 (49.6)
Secondary	31 (35.2)	52 (59.1)	25 (28.4)	23 (26.1)	48 (54.5)
University or more	36 (32.4)	65 (58.6)	27 (24.3)	26 (23.4)	56 (50.5)
P-value	0.729	0.564	0.422	0.933	0.877
<b>Father occupation:</b>					
Non worker	5 (25)	13 (65.0)	4 (20.0)	4 (20.0)	13 (65.0)
Manual worker	46 (30.9)	86 (57.7)	42 (28.2)	39 (26.2)	73 (49.0)
Employee	75 (32.5)	135 (58.4)	57 (24.7)	52 (22.5)	121 (52.4)
P-value	0.771	0.825	0.622	0.659	0.387
<b>Mother occupation:</b>					
Non worker	78 (31.3)	146 (58.6)	68 (27.3)	59 (23.7)	128 (51.4)
Worker	48 (31.8)	88 (58.3)	35 (23.2)	36 (23.8)	79 (52.3)
P-value	0.923	0.944	0.360	0.973	0.860
<b>Residence:</b>					
Urban	61 (30.5)	104 (52.0)	48 (24)	46 (23.0)	105 (52.5)
Rural	65 (32.5)	130 (65.0)	55 (27.50)	49 (24.5)	102 (51.0)
P-value	0.667	<b>0.008</b>	0.423	0.724	0.764
<b>Family income:</b>					
Not enough & borrow	57 (29.4)	118 (60.8)	48 (24.7)	46 (23.7)	97 (50.0)
Enough	55 (34.0)	97 (59.9)	38 (23.5)	37 (22.8)	87 (53.7)
Enough and save	14 (31.8)	19 (43.2)	17 (38.6)	12 (27.3)	23 (52.3)
P-value	0.652	0.09	0.112	0.829	0.783

the overall percent predicted was 80.8% (as shown in table 4).

Predictors of parasitic infestations; rural residence (OR=1.51), artificial feeding (OR=17.3) with the overall

## DISCUSSION

The present study highlighted the main health problems among preschool children and found that; 58.5% parasitic infestations, 51.8% dental problems, 25.8% overweight/obese, 31.5% anemia and 23.8% underweight for age. These results agree with the study carried out in Sri Lanka and concluded that malnutrition anemia are the most common diseases that impact preschool children.<sup>13</sup> Another study carried out in Egypt<sup>14</sup> and found that; 48.5% of the children under the age of 6 were anemic with higher

percent predicted was 73.2% (as shown in table 6). The only predictor of dental problems was NICU admission (OR=2.71) with the overall percent predicted was 75.0% (as shown in table 4).

prevalence among rural than urban residence (51% vs. 44 %, respectively). In Iran, a cross sectional study on preschool children<sup>15</sup> reported higher prevalence of dental caries among preschool children under the age of 6 years (69.9%) Higher prevalence of underweight in 32% of Pakistan preschool children.<sup>16</sup> A study on preschool children in the East Mediterranean region, found the prevalence of obesity was 3% in the UEA, Iran, and Pakistan, and 8.6% in Egypt.<sup>17</sup> In other studies, The reported prevalence of overweight and obesity among preschool children was

**Table (2) cont'n: Relation between child-related variables and prevalence of health problems among studied children.**

	Anemic N=126 (31.5%)	Parasitic infestations N=234 (58.5%)	Overweight/Obesity N=103 (25.8%)	Underweight for age N=95 (23.8%)	Dental problems N=207 (51.8%)
<b>Mode of delivery:</b>					
Vaginal delivery	50 (33.3)	97 (64.7)	39 (26)	35 (23.3)	78 (52.0)
Cesarean delivery	76 (30.4)	137 (54.8)	64 (25.6)	60 (24.0)	129 (51.6)
P-value	0.541	0.053	0.929	0.879	0.938
<b>NICU admission:</b>					
No	115 (32.3)	211 (59.3)	90 (25.3)	88 (24.7)	177 (49.7)
Yes	11 (25.0)	23 (52.3)	13 (29.5)	7 (15.9)	30 (68.2)
P-value	0.325	0.374	0.542	0.195	<b>0.02</b>
<b>Type of feeding:</b>					
Mixed	5 (2.2)	102 (44.3)	73 (31.7)	6 (2.6)	206 (89.6)
Artificial feeding	86 (78.2)	93 (84.5)	14 (12.7)	63 (57.3)	1 (0.9)
Exclusive breast Feeding (<6 months)	35 (58.3)	39 (65.0)	16 (26.7)	26 (43.3)	0
P-value	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>History of food allergy:</b>					
No	112 (30.5)	217 (59.1)	90 (24.5)	84 (22.9)	207 (56.4)
Yes	14 (42.4)	17 (51.5)	13 (39.4)	11 (33.3)	0
P-value	0.923	0.395	0.061	0.177	<b>&lt;0.001</b>

\* Parasitic infestations included Amoeba (66.7%), Oxyuris (23.1%), and Giardia (10.2%)

**Table (3): Relation between anemia and other health problems among studied children.**

Other health problems:	Total	Anemia N (%)	P-value
Parasitic infestations*	234	112 (47.9)	<0.001
Overweight/Obesity	103	9 (8.7)	<0.001
Underweight for age	95	93 (97.9)	<0.001

\*Parasitic infestations included Amoeba (66.7%), Oxyuris (23.1%), and Giardia (10.2%)

between combined feeding and childhood obesity is less clear.<sup>21</sup> In a follow up Chinese study that included 2,217 newborns, those who exclusively breast fed milk were less likely to be overweight or obese at the age 2 years compared to those who were formula fed.<sup>21</sup> Similarly, a study was carried out in Canada<sup>22</sup> and reported that; children who had combined feeding for less than 6 months were more likely to be overweight (OR= 1.29), while children who were only formula fed were more likely to be obese (OR= 1.57).

Anemia global prevalence in the preschool children is 43%.<sup>23</sup> In Pakistan, a higher incidence of anemia among preschool children (66%) was reported,<sup>16</sup> they found that independent risk factors related to child anemia included child age, family size, mothers' awareness of overall child healthcare, and parasitic infections.

16.6% and 8% in Italy,<sup>18</sup> 20.5% and 16.3% in Vietnam,<sup>19</sup> and 10.6% and 7.6% in Iran.<sup>20</sup>

In the present study; overweight/obesity was negatively correlated with anemia. There was statistically significant relation between prevalence of obesity among studied children older age (from 48 to 60 months) and infants with mixed feeding. A few studies showed that breast feeding appeared to protect against childhood obesity, although the relationship

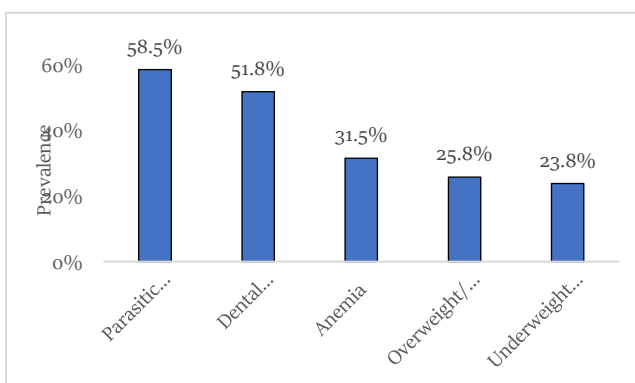
In the present study, the prevalence of parasitic infestation was 58.5% and it was significantly increased among anemic cases. Similarly; prevalence of intestinal parasitic infection was 60% among children and was significantly correlated with both anemia and malnutrition among preschool children in Chad.<sup>25</sup> Other studied<sup>26</sup> reported that, intestinal parasitic infection increased the risk of having anemia (OR= 2.84), 32.8% in Uganda,<sup>27</sup> 36.50% in Eritrea,<sup>28</sup> 44% in southern Sudan,<sup>29</sup> and 29.9% in Ethiopia.<sup>30</sup> Higher prevalence of parasitic infestation may be due to poor environmental sanitation and higher anemia prevalence was due to higher prevalence of parasitic infestation and malnutrition of the studied children.

**Study limitations:** This is a health facility-based study that lacks external validity, and its results cannot be generalized to community dwelling children.

**Table (4): Binary logistic regression for prediction of health problems among studied children.**

	AOR (95%CI)			
	Anemia	Overweight/ obesity	Underweight	Parasitic infestation
<b>Age (months):</b>				
12.0-	30.52 (8.96-50.1)*	Reference	1.05 (1.02-1.176)*	0.60 (0.054-6.63)
24.0-	1.95 (0.202-4.56)	1.25 (0.07-2.5)	1.03 (1.01-1.07)*	1.049 (0.396-2.78)
36.0-	1.167 (0.027-1.05)	1.81 (0.02-7.1)	1.048 (1.01-1.208)*	1.18 (0.513-2.72)
48.0-60	Reference	4.5 (1.12-8.1)*	Reference	Reference
<b>Type of feeding:</b>				
Mixed	60 (49.62-80.9)*	1.25 (1.04-4.25)*	Reference	Reference
Artificial feeding	33 (22.63-75.41)*	0.22 (0.107-3.51)	54.3 (4.64-60.5)*	17.26 (1.72-28.14)*
Breast Feeding	Reference	Reference	30.98 (2.53-38.4)*	4.77 (0.475-47.95)
<b>Parasitic infestations</b>	14.36 (3.7-55.5)*			
<b>Obesity</b>	1.79 (0.607-5.3)			
<b>Underweight for age</b>	30 (21.5-60.58)*			
<b>Gender</b>				
Male	---	---		1.51 (0.926-2.45)
Female				Reference
<b>Number of siblings:</b>				
No (single child)	---	---		35.23 (0.95-35.72)
<3				0.565 (0.16-1.99)
≥3				Reference
<b>Residence</b>				
Urban	---	---		Reference
Rural				1.51 (1.24-2.43) *
Model $\chi^2$	400.15	16.55	151.65	130.39
Overall % predicted	93.5	74.2	80.8	73.2

Undefined because one of the studied cells is zero, AOR: Adjusted odds ratio, CI: confidence interval, --- non-significant in univariate analysis



**Figure (2): Main health problems of the studied preschool children**

Community study was not feasible due to COVID-19 lockdown.

## CONCLUSIONS

Parasitic infestations, dental problems, overweight/obesity, anemia and underweight for age are most common health problems among preschool

children. Such problems were demonstrated to be associated with numerous predisposing factors and significantly correlated with each other's (as revealed by anemia mediated parasitic infestation). Parents should be encouraged to attend regular checkups of their children including dental examination. Visits should focus on nutritional education, iron supplementation, personal hygiene, and vaccination. There is a need for large scale community-based study for proper assessment of the magnitude of the studies health problems.

## Ethical Approval

This study was approved by the Institutional Research Board (IRB) at Faculty of Medicine, Mansoura University (MD.19.11.260).

An informed written consent was taken from parents, to participate voluntarily in the study with a full right to withdraw, was obtained with assurance of confidentiality and anonymity of the data.

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**Conflicts of Interest:** All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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