Relation between the Indoor Home Environment and Physical Health Problems of Children Under Five Years

Heba Mahmoud Mohamed Abo khokha[1,2], SamiaE.Khaton[3], RabeaAbdRabo Mohamed AbdRaboand[4], Nahla Saied Mahmoud[5]

[1]Master Student at Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.
[2]Nursing Specialist at Dental Training Center, Damanhur, Egypt.
[3]Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.
[4,5]Assistant Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Heba Mahmoud Mohamed Abo khokha
Email: 1285717448x123456789@gmail.com

Abstract

Background: The indoor home environment significantly influences the physical health status of young children. **Aim of the study:** was to assess the relationship between the indoor home environment and physical health problems among under five children. **Design**: Analytical cross sectional study design. **Settings:** The current study was conducted at five Maternal and Child Health (MCH) centers in Tanta City. **Subjects:** A convenience sample of 432 children under five years old was included in the current study. **Tool**: A structured interview schedule was used in the current study which consisted of three parts: Part I): Socio-demographic characteristics of the child. Part II): Assessment of child's health status. Part III): Assessing scoring system of indoor home environment. **Results:** more than two-thirds (69.0%) of the studied children's mothers had un-sanitary indoor environment, while less than one-third (31.0%) of them had sanitary indoor environment. In addition, there was a statistical significance relation between sanitary level of indoor home environment and prevalence of common physical health problems such as respiratory, gastrointestinal, skin, eye and ear infections as well as home accidents and frequency of childhood illness among under five children. **Conclusion and recommendations:** poor housing conditions, inadequate ventilation, improper waste disposal, and overcrowding contribute to the prevalence of respiratory, gastrointestinal, skin, and infectious diseases among under five children. Socio-demographic factors such as parental education, occupation, and income levels also play a crucial role in determining household sanitary conditions and, consequently, children's health outcomes. Community health nurses should implement community-based awareness programs on home hygiene and how to maintain sanitary indoor home environment to help parents create a healthier environment for their children.

Key words: Indoor, environment, physical, health, problems.

Introduction

The physical health of young children is a crucial determinant of their long-term well-being, and early childhood health is strongly influenced by environmental factors (**Likhar, Baghel, & Patil, 2022).** Among these, the indoor home environment plays a significant role in shaping the health outcomes of children, particularly those under the age of five, who are most vulnerable to health risks. As this age group undergoes rapid physical and cognitive development, the quality of their immediate surroundings, including air quality, safety, sanitation, and the presence of environmental toxins, has profound implications on their physical health **(Vardoulakis et al., 2020).**

The World Health Organization (WHO) 2020 estimates that household air pollution causes 3.2 million deaths year, including more than 237 000 deaths of children under five worldwide. After being exposed to air pollution, children are twice as likely to acquire pneumonia. Children under five (≤5 years) in low-to-middle income countries (LMICs) experience 1.7 billion episodes of diarrhea and around half a million diarrhea-related fatalities annually **(Puthumana, Ngaage, Borrelli, Rada, Caffrey and Rasko .2021).**

Diarrhea is the second leading cause of death for children under five in Egypt. As per the Egyptian Family Health Survey (EFHS) (2021), diarrhea is more common in children under five years old that 12% of them get it **(Said, 2024).**

A child's physical health is closely tied to the quality of their living environment. Substandard housing with poor ventilation, mold, pests, lead-based paint, and inadequate sanitation can increase the risk of respiratory illnesses, allergies, and infections. For example, exposure to mold and dampness is known to exacerbate asthma symptoms and contribute to respiratory infections, which are common in children. Furthermore, children in poorly maintained homes may face higher risks of accidents and injuries, such as falls, burns, or poisoning, due to unsafe living conditions **(Tusting et al., 2020).**

Environmental factors, such as exposure to pollution or environmental toxins, can also affect child health and development. For instance, children living near industrial areas or heavy traffic may be exposed to higher levels of air pollution, which can lead to respiratory problems and developmental delays. Housing policies and urban planning that prioritize clean; safe environments contribute to healthier child development. **(Street et al., 2024).**

Long-term housing stability is essential for positive child development outcomes. Children who experience stable housing are more likely to grow up in an environment that fosters healthy physical, emotional, and cognitive development. Secure housing allows families to invest in long-term goals, such as education and healthcare, including chronic stress, poor academic performance, and behavioral problems. **(DeCandia, Volk, & Unick, (2022).**

A Community Health Nurse – Child Health and Environment (child health refers to the physical, mental, emotional and social wellbeing of children and environment means all the surroundings that affect child's health and development, including physical environment as air, water, food, housing condition, cleanliness…est. focuses on the health of children within a community, specifically concerning environmental factors that can impact their well-being. They provide education to families and communities about the importance of maintaining a healthy indoor and outdoor environment for children's health, such as ensuring proper sanitation, safe drinking water, and clean air. Community Health Nurses also advocate for policies and programs that improve environmental conditions in communities. Their role is essential in preventing and mitigating the long-term effects of environmental risks on child health **(McCabe, Davis, Mandy, & Wong, (2022).**Community environmental health specialists educate families on the impact of their home and community environments on their child's health and help implement changes to reduce risks. They collaborate with healthcare providers, community organizations, and policymakers to promote environmental health standards that protect children from harmful exposures. This role is particularly important in providing direct care and education to families living in areas with high environmental risks, ensuring that children grow up in environments conducive to good health. **(Hookway, & Brown, 2023).**

Significance of the study

Children health and well-being are impacted by the quality of their indoor environment. Children's exposures in the home will be significantly influenced by their play activities and housekeeping tasks. Numerous environmental factors can impact children under five year's old health and raise the occurrence of disorders. Air, water, and food pollution, household waste, rodent and insect management, and safe housing are some of the elements that lead to a variety of chronic health impacts. A young child's prospects of survival and development are greatly influenced by their home environment.**(Ferguson, Penney, & Solo-Gabriele, (2017).**Several studies have focused on the correlation between specific aspects of the home environment, such as indoor air quality, the presence of pollutants, and physical health issues such as asthma, respiratory infections, and general developmental delays in children However, comprehensive data examining the cumulative effects of multiple indoor environmental factors on the physical health status of children under five is still limited. Addressing these gaps can provide valuable insights for policy makers and healthcare providers looking to improve child health outcomes through targeted interventions at the community and household level. Therefore, this study aims to evaluate the relationship between the indoor home environment and the under five physical health problems **(Kumar et al., 2023).**

The aim of this study was to

Assess the relation between indoor home environment and under five physical health problems.

Research questions:

1. What are the common physical health problems affecting under five children?
2. What is the level of sanitation at indoor home environment of under five children?
3. What is the relation between indoor home environment and physical health problems of children under five years?

Subjects and method

Subjects

Study design

For achieving the aim of the current study, Analytical cross sectional study design was used in this study.

Study settings

The current study was conducted at two medical Centers and three Maternal and Child Health Centers (MCH) in Tanta City, which are affiliated to Ministry of Health at El Gharbia Governorate (Dr. Mohamed Mashally medical center, El-Imbaby MCH center, Segar medical center, Kohafa MCH center and Elegize MCH center).

Study subjects

A convenient sample of total (432) under- five children attending the previous setting for physical checkup or immunization were selected and included in the study. The sample size and power analysis were calculated using Epi-Info software statistical package created by World Health organization (WHO) and center for Disease Control and Prevention(CDC), Atlanta, Georgia, USA version 2002. The total number of children attending the child clinic with their mothers at the five MCH centers during the last month was found to be 3600 child with their mothers. The sample size was found to be (432) children (which constitute12% of the suspected sample).

Tools of data collection

A structured interview schedule was developed by the researcher to collect the necessary data for the study after reviewing the related literatures **Alburaiki, Hany, Riad, & Osman,. (2021); Bush, Wakschlag, LeWinn, Hertz-Picciotto, & Nozadi, (2020); Kininmonth, Smith, Llewellyn, Dye, & Lawton, (2021), Marsh, Dobson & Maddison. (2020). Thoreia, Nazek, Shokrla & Safaa. (2011). & Zhong, Kuhn, Wang, Liu, & Luo. (2020).** which consisted of three parts as follows:

Part I: Socio-demographic characteristics of the studied under five children: It included 12 items including Age, sex, birth order, residence, mother's and father's level of education and mother's and father's occupation, family income, number of family members, number of rooms and crowding index.

Part II: -Assessment of child's health status: It composed of 25questions to assess the child's health statusand child's health problems in the last 6 monthsas follows:

A. Child's health history: it consisted of 7 questions covering history of:

- Respiratory health problems such as bronchial asthma, cough, colds and its frequency, inflammation of

the tonsils (sore throat, fever) Cough and its frequency)
- Gastrointestinal health problems such as diarrhea, abdominal colic, parasitic diseases).
- Infectious diseases such as (measles, German measles, chickenpox, parotitis, poliomyelitis, whooping cough, diphtheria, rheumatic fever, jaundice and typhoid).
- Domestic accidents such as (poisoning and its causes, injury in an accident, burns and its causes, an animal bite and suffocation and its causes).
- Skin health problems such as boils, scabies, and warts.
- Eye health problems such as (bacterial eye infection, allergies to the eye and inflammation of the cornea).
- Ear health problems such as (bacterial ear infection, infection (redness) in the outer ear and blockage in the ear canal.

B. Anthropometric measurements: it consisted of 5 questions whichincluded child (weight in kilograms, length/height, Head circumference, Chest circumference and Arm circumference).

C. Assessment of the Child General appearance. It consisted of 13 questions as (general hygiene, face, condition of skin, hair, nail, eyes, nose, ear, throat, mouth (teething), chest, abdomen and extremities.).

Part III: -Assessing of Indoor Home environment (IHE): This part assessed the nature of children indoor home environment as reported by their mothers it consisted of 34 questions as; Type of building material, sources of nature and artificial ventilation, sources of nature and artificial lighting, source of water, sewer type,sewage disposal, dispose of garbage bathroom and its sanitary condition , the kitchen and its sanitary condition, presence of an animal barn and its location, presence of domestic birds and its location, presence of pets ,storage of the medicines in the house, type of pesticides and its storage, type of industrial detergents and its storage, Chemical fertilizers storage, cleaning of the house, presence of moisture in the house and method of heating.

Scoring system of Indoor Home environment

Each item of an indoor home environment was given a score. One score (1) was given to the Presence of positive items and score zero (0) was given to absence of positive items and presence of negative items.

The total score of indoor home environment was calculated and classified as

- **Healthy indoor environment** ≥ 85% of total score
- **Unhealthy indoor environment** < 85% of total score.

Method

1. Obtaining approvals

An official permission to carry out the current study was obtained from Dean of the Faculty of Nursing to director of Directorate of Health Affairs at El Gharbia Governorate which affiliated to ministry of health and population.

The director of Directorate of Health Affairs at El Gharbia Governorate was informed about the objectives of the study to gain their permission and cooperation to collect data from the

selected previously mentioned settings.

2. Ethical and legal consideration

- The approval of the Faculty of Nursing Scientific Research Ethical Committee was obtained to conduct the study (code: 146-12-2022).
- An informed consent was obtained from all study subjects after providing appropriate explanation about the purpose of the study.
- Nature of the study didn't cause any harm or pain for the entire sample.
- Anonymity, confidentiality and privacy were considered regarding the collected data.

3. Developing the study tools

The study tool was developed by the researcher based on literature review and prepared in Arabic language.

The study tool was tested for face and content validity by jury of seven professors' expertise in the field of Community Health Nursing before conducting the study. Validity result ranged from (95% to 98%).

4. Pilot study

A pilot study was carried out by the researcher on 10% of the sample for testing the tool for its clarity, applicability and to identify obstacles that may be encountered with the researcher during data collection. No necessary modifications were made so, this sample were included in the study.

5. Reliability of the study tools

The study tool was tested for its reliability using Cronbach's Alpha test. It was found to be (0.665) for the entire study tool, with confidence level 95% and significant difference < 5%.

6. The actual study

- The data collection of the present study was done by the researcher through meeting the studied children with their mother at the Maternal and Child Health Centers (MCH).
- The aim of the study was explained to each mother.
- The structured interview sheet was individually fulfilled from each mother with her child at the previously mentioned settings through asking questions and getting answers.
- The researcher met the subjects three days per week. (Saturday, Monday and Wednesday).
- The average time spent for collecting the data from each subject was 30-45 minutes.
- The data was collected by the researcher over a period starting from beginning in early March 2024 and ended late in June 2024.

7. Statistical analysis

The collected data was organized, tabulated and statistically analyzed using statistical package for social studies (SPSS) version 23. The mean, standard deviation and range were calculated for quantitative data, comparison was done using chi-square test (x^2). Pearson's correlation coefficient (r) was used to identify correlation between variables. A significance was adopted at $P<0.05$ for interpretation of results of tests of significance (*). Also, highly significant was adopted at $P<0.01$ for interpretation of results of tests of significance (**).

Results

Table (1): Distribution of the studied under five children based on their socio-demographic characteristics. The table shows that the age of the studied under five children ranged from 1-5years old with a mean age (2.94 ± 1.395) year. Slightly less than two thirds (60.2%) were aged between 3 and 5 years. Also, about half (50.9%) of them were males. While more than one-third (38.4%) of them their birth order was second-born, and more than two-thirds (68.5%) of them lived in rural areas.

Concerning mothers' education, it was obvious that, nearly half (49.5%) of the studied under five children's mothers had secondary education and about one-quarter (26.4%) of them had university or postgraduate education. Regarding mothers' occupation, it was found that, slightly less than two-thirds (63.2%) of the studied under five childrens'mothers were housewives and more than one-quarter (29.9%) of them were employed. Regarding fathers' occupation and education, it was found that nearly half (44.7%, 45.1% and 48.8 %,) of the studied under five children' fathers had secondary education, daily wage workers and employees respectively. As regards family income, the table illustrates that, nearly half (49.8%) of the studied under five children's families had enough income, while about one-third (31.2%) of their families had not enough income.

Regarding number of family members it was found that half (50%) of the studied under five children's families had 3-4 members. Regarding the number of rooms in the household, it was found that about half (50.5%) of the studied under five children's houses consisted of 1-2 rooms and the other nearly half (49.5%) of them their houses consisted of 3-4 rooms. As regards to crowding index, the majority (82.4%) of the studied under five children's households had a crowding index of two rooms or less.

Table (2): represents means and standard deviations of indoor sanitary environment items for the studied under five children as reported by their mothers. The table shows that kitchen facilities and Building facilities show the highest mean score at (12.48 ± 2.123) and (11.63± 0.782) respectively, followed by Garbage facilities, Bathroom facilities and Storage medicine facilities which had mean scores of (6.23 ± 1.044), (5.92 ±1.110) and (5± 0.462) respectively. The lowest mean scores were found among presence of birds and pets at home which represent (0.69 ± 0. 570), and (0.85 ±0.358) respectively. The total means and standard deviations of indoor sanitary environment was (82.72 ± 7.665).

Figure (1): **represents the distribution of the studied under five children according to their total levels of sanitary indoor environment.** The figure illustrates that, more than two- thirds (69%) of the studied under five children had Un-sanitary indoor environment, this compared to less than one-third (31.0%) of them had sanitary indoor environment.

Table (3): Represents the relationship between socio-demographic characteristics of the studied under five children and the levels of indoor home environment. The table shows that, there was a highly significant relationship between levels of indoor home environment and socio -demographic characteristics of the studied under five children regarding age in years, birth order, mother's educations, father's educations, father's occupation, mother's occupation, family income, number of rooms and crowding index p< (0.001) . It also reveals that, there was a statistically significant relationship between levels of indoor sanitary environment and their sex and place of residence p< (0.05).

Table (4): Represents the relationship between the history of exposure to eye, ear and skin infection of the studied under five children as reported by their mothers and the levels of indoor home environment. The table illustrates that, there was a highly significant relationship between indoor home environment and their history of exposure to eye and ear infection such as: (bacterial eye infection, inflammation of the cornea, bacterial ear infection, infection in the outer ear and a blockage in the ear Canal) P= (0.001**). On the other hand, there is a significant relationship between the levels of indoor home environment and occurrence of allergic to the eye of the children P= (0.018*). Also, the table shows that, there was a highly significant relationship between indoor home environment and the history exposure to all skin problems during the last six months p = (0.001), except with scabies and skin allergy.

Table (5): Represents the relationship between the history of respiratory problems of the studied under five children as reported by their mothers and the levels of indoor home environment. The table illustrates that, there was a highly significant relationship between indoor home environment and the history of exposure to respiratory problems such as: (frequency of colds attacks, tonsillitis and its frequency attacks, cough and its attacks) among the children P= (0.001). On the other hand, there is no significant relationship between the levels of indoor home environment and the occurrence of bronchial asthma and the frequency of its attacks p = (0.416&0.391) respectively.

Table (6): shows the relationship between gastrointestinal (GIT) problems in the studied under five children as reported by their mothers and the levels of indoor home environment. The table shows that, there was a highly significant relationship between indoor home environment and the history of exposure to gastrointestinal (GIT) problems such as: (frequency and severity of diarrheal and frequency of its attacks and chemical poisoning) P= (0.001**). As regard to history of parasitic infection, the table shows that two thirds (66.9%) of children having an unsanitary indoor home environment had history of parasitic infection compared to only one third (33.1%) of those having sanitary

indoor environment. However, there was no significant relationship between indoor environment and history of parasitic infestation.

Table (7): represents the relationship between the histories of infectious diseases of studied under five children, as reported by their mothers, and levels of indoor home environment. The table reveals that, there was a highly significant relationship between indoor home environment and history of the studied under five children regarding exposure to measles and germane measles and chicken pox during the last six months p<(0.01) No significant relation was found with parotitis and whooping cough p>(0.05).

Table (8): represents the relationship between the history of home accidents among children as reported by their mothers and the levels of indoor home environment. The table illustrates that, there was a highly significant relationship between indoor home environment and exposure of the children to home accidents during the last six months such as, falling, burn, animal bite and suffocation. p = (0.001)**.**

Table (1): Distribution of the studied under five children according to their socio-demographic characteristics

Variables	The studied sample (n=432)	
	No	%
Age in years		
1-2	172	39.8
3-5	260	60.2
Mean±SD	2.94±1.395	
`range	1-5	
Sex		
Males	220	50.9
Females	212	49.1
Birth order		
First	67	15.5
Second	166	38.4
Third	109	25.2
Fourth	83	19.2
Fifth	7	1.6
Place of residence		
Rural	296	68.5
Urban	136	31.5
Mothers' educations		
Illiterate or read &write	52	12.0
Basic education	52	12.0
Secondary education	214	49.5
University and post graduate education	114	26.4
Mother occupation		
House wife	273	63.2
Daily wage worker	30	6.9
Employee	129	29.9
Fathers' educations		
Illiterate or read &write	111	25.7
Basic education	4.9	4.9
Secondary education	193	44.7
University and post graduate education	107	24.8
Fathers occupation		
Not working	26	6.0
Daily wage worker	195	45.1
Employee	211	48.8
Family income		
Enough	215	49.8
Enough and save	82	19.0
Not enough	135	31.2
Number of family member		
3-4	216	50.0
5-6	209	48.4
More than 6	7	1.6
Range	3-7	
Mean±SD	4.58±2.56	
Numbers of rooms		
1-2	218	50.5
3-4	214	49.5
Range	1-4	
Mean±SD	2.56±0.629	
Crowding index:		
≤ 2	356	82.4
> 2	76	17.6

Table (2): Means and standard deviations of indoor sanitary environment items of the studied under five children homes as reported by their mothers

Sanitary indoor environment items	The studied under five children (n=432)
	Mean ± SD
Building facilities	11.63 ± 0.782
Ventilation facilities	2.22 ± 0.413
Lighting facilities	2.00 ± 0.000
Water and sewage facilities	2.75 ± 0.768
Garbage facilities	6.23 ± 1.044
Bathroom facilities	5.92 ± 1.110
Kitchen facilities	12.48 ± 2.123
Animal barn control	4.03 ± 0.504
Presence of birds	0.69 ± 0. 570
Presence of pets	0.85 ± 0.358
Storage medicine facilities	5.000 ± 0.462
Pesticide storage	3.83 ± 0.968
Industrial detergents storage	2.75 ± 0.984
Chemical fertilizer storage	1.65 ±0.752
Presence of insect and rodent	1.81 ± 0.909
Cleaning home facilities	3.86 ± 0.517
Ventilating home activities	2.55 ± 0.696
Home moisture	1.55 ± 0.772
Heating activities in home	3.42 ± 0.802
Total indoor sanitary environment	82.72 ± 7.665

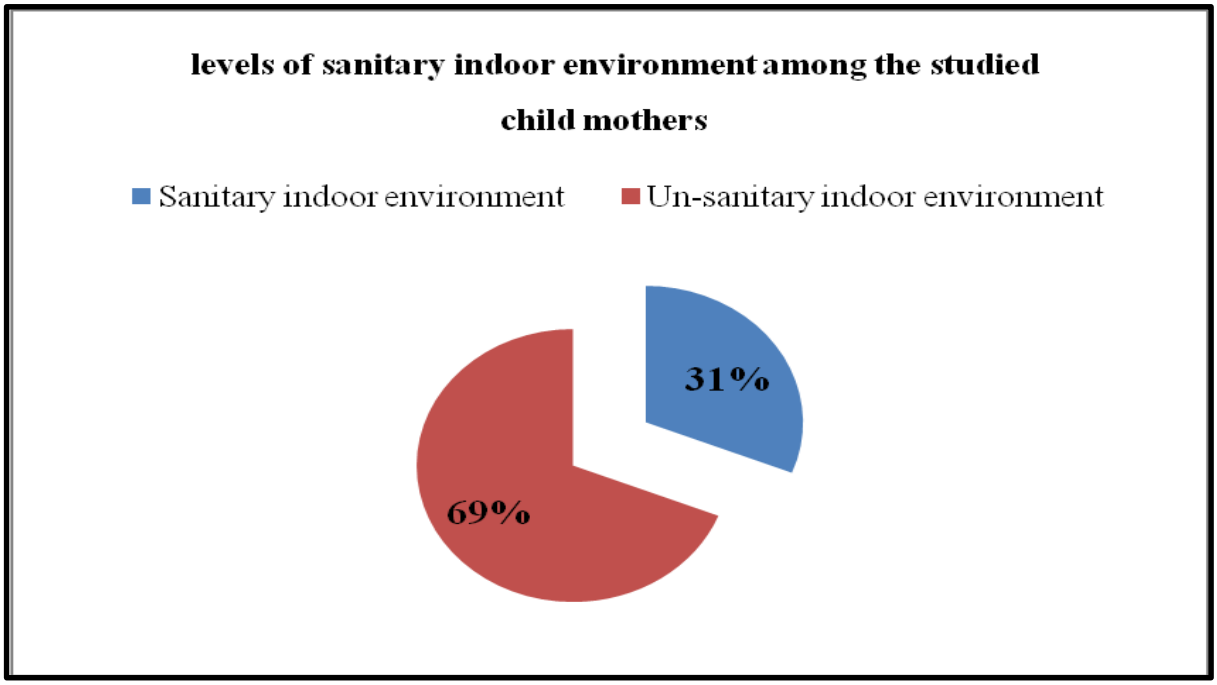

Figure (1): Distribution of the studied under five children according to their levels of sanitary indoor environment.

Table (3): Relation between socio-demographic characteristics of the studied under five children and levels of indoor home environment.

Variables	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 `p
	No	%	No	%	
Age in years					10.640
1-2	134	77.9	38	22.1	
3-5	164	63.1	96	36.9	0.001**
Sex					4.123
Males	142	64.5	78	35.5	0.042*
Females	156	73.6	56	26.4	
Birth order					
First	56	83.6	11	16.4	
Second	103	62.0	63	38.0	18.504
Third	82	75.2	27	24.8	0.001**
Fourth	50	60.2	33	39.8	
Fifth	7	100.0	0	0	
Place of residence					
Rural	215	72.6	81	27.4	5.866
Urban	83	61.0	53	39.0	0.015*
Mothers' educations					
Illiterate or read &write	28	53.8	24	46.2	46.691
Basic education	20	38.5	32	61.5	0.001**
Secondary education	178	83.2	36	16.8	
University and post graduate education	72	63.2	42	36.8	
Fathers' educations					
Illiterate or read &write	57	51.4	54	48.6	
Basic education	20	95.2	1	4.8	28.270
Secondary education	148	76.7	45	23.3	0.001**
University and post graduate education	73	68.2	34	31.8	
Father occupation					
Not working	26	100.0	0	0	12.697
Daily wage worker	133	68.2	62	31.8	0.002**
Employee	139	65.9	72	34.1	
Mother occupation					
House wife	194	71.1	79	28.9	18.386
Daily wage worker	29	96.7	1	3.3	0.001**
Employee	75	58.1	54	41.9	
Family income					
Enough	117	54.4	98	45.6	42.949
Enough and save	66	80.5	16	19.5	0.001**
Not enough	115	85.2	20	14.8	
Number of family member					
3-4	141	65.3	75	34.7	
5-6	150	71.8	59	28.2	5.292
More than 6	7	100.0	0	0.0	0.071
Number of rooms					
1-2	163	74.8	55	25.2	6.893
3-4	135	63.1	79	36.9	0.009**
Crowding index:					
≤ 2	231	64.9	125	35.1	15.850
> 2	67	88.2	9	11.8	0.001**

p<0.05* significant p<0.01** highly significant

Table (4): Relation between the history of exposure to eye, ear and skin infection of the studied under five children and levels of indoor home environment as reported by their mothers

History of exposure of children to eye, ear and skin infection during the last six months	The studied under five children (n=432)				
	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 P
	No	%	No	%	
Having bacterial eye infection					
Yes	141	75.4	46	24.6	6.351
No	157	64.1	88	35.9	0.008**
Having allergic to the eye					
Yes	145	74.4	50	25.6	4.804
No	153	64.6	84	35.4	0.018*
Suffering from inflammation of the cornea (redness of the whites of the eye)					
Yes	187	79.9	47	20.1	28.521
No	111	56.1	87	43.9	0.001**
Having bacterial ear infection (pus secretions)					
Yes	152				
No	146	78.4	42	21.6	14.446
		61.3	92	38.7	0.001**
Having an infection (redness) in the outer ear					
Yes	17	29.8	40	70.2	47.053
No	281	74.9	94	25.1	0.001**
Having a blockage in the ear canal (Bead- pin- glass ball)					
Yes	21	42.0	29	58.0	
No	277	72.5	105	27.5	19.238
					0.001**
Having boils in the skin (impetigo)					
Yes	105	86.8	16	13.2	24.875
No	193	62.1	118	37.9	0.001**
Frequency of boils attack			16		0.001**
From1-2 times	94	85.5	0	14.5	
From 3-4 times	11	100.0		0.0	
Having scabies					
Yes	43	76.8	13	23.2	1.831
No	255	67.8	121	32.2	0.176
Having lice					
Yes	32	39.5	49	60.5	40.479
No	266	75.8	85	42.2	0.001**
Having an allergic reaction to the skin (red spots on the skin or small red blisters)					
Yes	113	71.5	45	28.5	0.750
No	185	67.5	89	32.5	0.387

p<0.05* significant p<0.01 highly significant**

Table (5): Relation between histories of exposure to respiratory problem of the studied under five children as reported by their mothers and levels of indoor home environment

History of exposure of children to respiratory diseases during the last six months	The studied under five children (n=432)				
	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 P
	No	%	No	%	
Frequency of colds attack among children					
From1-2 times	90	64.7	49	35.3	69.524
From 3-4 times	118	97.5	3	2.5	
5 and more	90	52.3	82	47.7	0.001**
Having tonsillitis (difficulty swallowing – fever)					
Yes	231	63.5	133	36.5	32.9
No	67	98.5	1	1.5	0.001**
Frequency of tonsillitis attack					
No attack	67	98.5	1	1.5	
From1-2 times	125	67.6	60	32.4	37.2
From 3-4 times	64	62.7%	38	37.3	0.001**
5 and more	42	54.5	35	45.5	
Suffering from cough					
Yes	298	78.4	82	21.6	131.4
No	0	0.0	52	100.0	0.001**
Frequency of cough attack					
No attack	0	0.0	52	100.0	159.8
From1-2 times	83	89.2	10	10.8	
From 3-4 times	119	77.3	35	22.7	0.001**
5 and more	96	72.2	37	27.8	
Suffering from bronchial asthma					
Yes	153	68.3	71	31.7	0.100
No	145	69.7	63	30.3	0.416
Frequency of bronchial asthma					
From1-2 times	123	69.9	53	30.1%	3.006
From 3-4 times	24	68.6	11	31.4	0.391
5 and more	6	100.0	0	0.0	

p<0.05* significant p<0.01 highly significant**

Table (6): Relation between histories of exposure to gastrointestinal (GIT) problems of the studied under five children as reported by their mothers and levels of indoor home environment

History of exposure of studied under five children to gastrointestinal (GIT) problems during the last six months	The studied child's mothers (n=432)				
	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 P
	No	%	No	%	
Having diarrhea					
Yes	248	67.9	117	32.1	2.454
No	50	74.6	17	25.4	0.075
Frequency of diarrhea attack in the last 6 months					
From1-2 times	177	77.0	53	23.0	31.376
From 3-4 times	65	50.4	64	49.6	0.001**
5 and more	6	100.0	0	0.0	
severity of diarrhea					
Mild diarrhea	138	80.7	33	19.3	
Moderate diarrhea	95	54.6	79	45.4	29.139
Severe diarrhea	15	75.0	5	25.0	0.001**
poisoning by a chemical					
Yes	42	60.0	28	40.0	3.149
No	256	70.7	106	29.3	0.053
Causes of chemical poisoning					
Chlorine	23	45.1	28	54.9	22.650
Medicines	12	100.0	0	0.0	0.001**
Insecticides	7	100.0	0	0.0	
Infected with parasitic worms					
Yes	103	66.9	51	33.1	0.492
No	195	70.1	83	29.9	0.276
Type of parasite					0.492
Oxyuris	103	66.9	51	33.1	0.276

p<0.05* significant p<0.01 highly significant**

Table (7): Relation between histories of exposure to infectious diseases of the studied under five children as reported by their mothers and levels of indoor home environment

History of infectious disease	The studied under five children (n=432)				
	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 P
	No	%	No	%	
infected with any of these infectious diseases					
Measles Yes No	**17** **281**	**33.3** **73.8**	34 100	**66.7** **26.2**	**34.344** **0.001****
German measles Yes No	**4** **294**	**14.8** **72.6**	**23** **111**	**85.2** **27.4**	**39.491** **0.001****
Chicken pox Yes No	**4** **294**	**40.0** **69.7**	**6** **128**	**60.0** **30.3**	**4.018** **0.045***
Parotitis Yes No	**0** **298**	**0.0** **69.1**	**1** **133**	**100.0** **30.9**	**2.229** **0.135**
Whooping cough Yes No	**52** **2**	**78.8** **67.2**	**14** **120**	**21.2** **32.8**	**3.501** **0.061**

p<0.01 highly significant p<0.05* significant**

Table (8): Relation between history of exposure to home accidents of the children as reported by their mothers and levels of indoor home environment

History of children to home accidents	The studied sample (n=432)				
	Un-sanitary indoor environment (n=298)		Sanitary indoor environment (n= 134)		X^2 P
	No	%	No	%	
Exposed to falling					
No, not exposed	18	29.0	44	71.0	62.245
Yes, Falling down from the stairs of the house	84	86.6	13	13.4	0.001**
Yes, Skating on the floor	64	68.1	30	31.9	
Yes, Falling from the chair	132	73.7	47	26.3	
Suffering from burns					
No, not exposed	222	72.3	85	27.7	
Yes from Boiling water	53	66.3	27	33.8	18.200
Yes from gas stove	8	38.1	0	0.0	0.003**
Yes from wabour Jazz	3	100.0	0	0.0	
Yes from boiling oil	8	47.1	9	52.9	
Yes from caustic materials	4	100.0	0	0.0	
Bitten by an animal					
No	228	65.7	119	34.3	16.693
Yes from dog	32	100.0	0	0.0	0.001**
Yes from cat	37	71.2	15	28.8	
Yes from mouse	1	100.0	0	0.0	
child suffocated					
No suffocation	245	64.6	134	35.4	27.165
Yes from smoking	10	100.0	0	0.0	0.001**
Yes from Burning wood or firewood	43	100.0	0	0.0	

p<0.05* significant p<0.01 highly significant**

Discussion

Healthy children are essential assets for ensuring the future well-being and prosperity of any society. The early years of life play a pivotal role in shaping the physical, cognitive, and emotional development of children. However, numerous factors threaten the health and growth of children, particularly those under the age of five, who are among the most vulnerable groups in any population. These threats include inadequate living conditions, poor sanitation, malnutrition, and exposure to environmental pollutant **(Likhar, Baghel, &Patil (2022).**The indoor home environment significantly influences the physical health status of young children. As children spend a considerable amount of their time indoors, their health is profoundly impacted by factors such as air quality, ventilation, cleanliness, water quality, and exposure to harmful chemicals. **(Vardoulakis et al., 2020.).**So, the aim of this study was to assess the relationship between indoor home environments and the physical health problems of children under

five. Regarding to the socio-demographic characteristics of the studied children the current study results found that, nearly two -thirds of the studied children aged 3–5 years and more than half of them were male and more than two-thirds of them lived in rural areas **(Table I).** These results consistent with a study conducted by **Attia, ElKashlan & Saleh. (2024)** about early childhood caries risk indicators among preschool children in rural Egypt, Egypt, which reported that more than half of the studied children their age ranged from 3–5 years. And also consistent with a study conducted by **Abdelhady and Farag (2023)** about understanding inequities in child mortality in Egypt which reported that more than half of the studied children were male and more than two-thirds of the studied children reside in rural areas, also found that rural residence in Egypt is associated with higher child mortality rates due to socioeconomic and environmental inequities compared to urban areas respectively.

In relation to occupation and education of the studied under five children's mothers, The present study findings was attributed that, only more than one-quarter of them were employed and had university or postgraduate education respectively **(Table I).**This findings are in the same line with **Mohammed, Wassif, Hakim & Moustafa, M. E. (2019)** who conducted a study about unintentional home injuries in children under five in Cairo, Egypt, and found that more than one-quarter of the studied under five children's mothers were employed and had university or postgraduate education. These results assure that the education and working status of the mothers are still need to more attention as this may affect the access to health information, health care services and awareness of the importance of the sanitary environment which may influence the overall child health status.

As regard to means and standard deviations of indoor sanitary environment items for the studied under five children, the current study results reported that, the lowest mean scores was found among presence of birds and pets at home which represent (0.69 ± 0. 570), and (0.85 ±0.358) respectively. The total means and standard deviations of indoor sanitary environment was (82.72 ± 7.665) **(Table 2).** These results are consistent with a study by **Budge et al. (2022)** conducted in Ethiopia, which examined the role of domestic animals in bacterial contamination of infant transmission pathways, the study found that the presence of domestic animals including birds and pets at home significantly contributed to increased bacterial contamination on surfaces and hands, potentially increasing infection risks for young children. Also, mean scores was found among cleaning home facilities and ventilating home activities which represent (3.86 ± 0.517), and (2.55 ± 0.696) respectively **(Table 2).** These results These practices are closely aligned with public health guidelines and strongly supported by **Abdel-Salam (2022)** and **Vardoulakis et al. (2020),** who emphasized the critical role of household cleaning and ventilation in preventing airborne and

surface-transmitted diseases in children.

Generally, the present study results highlighted that, according to the total levels of sanitary indoor environment, more than two- thirds of the studied under five children had un-sanitary indoor environment **(Figure 1).** This finding aligns with **Mondal& Paul, (2020).**who study effects of indoor pollution on acute respiratory infections among under-five children in India and found that more than two-thirds of the under five children had poor indoor environment, poor ventilation and low socioeconomic status which increase rates of respiratory infection and infectious disease among young children that emphasizing the critical impact of un-sanitary indoor environment on health of under five children.

In relation to the relationship between socio-demographic characteristics of the studied under five children and the levels of indoor home environment, the current study findings illustrated that, a highly significant relationship between levels of indoor home environment and socio -demographic characteristics of the studied under five children regarding age in years, birth order, mother's and father's educations, father's and mother's occupation, family income, number of rooms and crowding index $p< (0.001)$ **(Table 3).**These findings are strongly supported by **Abdel-Salam (2022) and Likhar et al. (2022)**, who noted that higher parental education and income levels are consistently linked to safer and healthier household environments. Additionally, the study found a significant relationship ($p<0.05$) between environment scores and sex and residence, suggesting potential gender-based vulnerability or urban-rural disparities. **Nyamusi (2021)** similarly reported better sanitation practices in urban than in rural households in East Africa.

As regard to the relation between levels of indoor home environment and different physical health problems among studied under five children the current study revealed that, there was a highly significant relationship ($p = 0.001$) between poor indoor home environments and history of exposure to eye and ear infections, including bacterial eye infection, corneal inflammation, and ear canal blockages **(Table 4).** This aligns with studies by **Abdel-Salam (2022) and Sadrizadeh et al. (2022)**, both of which link indoor air pollution, moisture, and vector presence to increased ENT infections. Notably, there was a significant relationship with allergic eye conditions ($p = 0.018$), this result could be due to their multifactorial etiology, including genetic predisposition or external allergens not confined to the home.

Additionally, the current study showed that, a highly significant relationship ($p=0.001$) between the indoor environment and the frequency of respiratory issues such as colds, tonsillitis, and cough. However, there was no significant relationship with bronchial asthma and its frequency ($p = 0.416, 0.391$) **(Table 5).** This results may be attributed to the chronic nature of asthma that goes beyond short-term environmental exposure and involves immunologic and genetic factors also not all children are equally sensitive to

indoor environmental triggers, while some may develop asthma symptoms due to dust, mold, as discussed by **Bozzola et al. (2024)** also, These findings were supported by **El-Koofy, El-Shabrawi, Abd El-alim, Zein& Badawi. (2022).** who reported high prevalence rates of respiratory infections among under-five Egyptian children, particularly in overcrowded or low-ventilation households.Otherwise, the study result was incongruent with results of the study conducted by **Gruenwald, Seals, Knibbs& Hosgood. (2023).**This demonstrated a significant positive relationship between indoor environment and the incidence of childhood asthma in the United States. The study concluded that childhood asthma cases could be attributed to exposure to nitrogen dioxide emitted from gas cooking appliances.

Moreover, the present study results highlighted that, there was a highly significant relationship (p=0.001) between the indoor home environment and gastrointestinal (GIT) issues, including the frequency of diarrheal attacks, types of diarrhea, and chemical poisoning. Children from homes with unsanitary environments were more likely to suffer from repeated diarrhea and chemical exposure **(Table 6).** This aligns strongly with the findings of **Bekele, Rawstorne& Rahman. (2020).** who demonstrated that poor water quality, inadequate sanitation, and unsafe chemical storage significantly increase the risk of gastrointestinal illnesses. **Abdel-Salam (2022)** also noted that households using unregulated pesticides and cleaning agents without safety protocols reported higher rates of child poisoning and enteric diseases.

Concerning to the relationship between the indoor environment and exposure to infectious diseases such as measles, German measles, and chickenpox ($p < 0.05$). The current study findings reflected how inadequate home hygiene and ventilation can contribute to the spread of infectious agents within families **(Table 7). Abdelhady and Farag (2023)** noted that crowding and poor household conditions often contribute to outbreaks of vaccine-preventable diseases, especially when herd immunity is compromised. However, no significant associations were observed for parotitis and whooping cough, potentially due to effective immunization coverage or lower seasonal prevalence during the study period. These results underscore that while household conditions influence disease transmission, vaccination plays a dominant role in preventing specific infectious diseases.

Regarding the relationship between the histories of home accidents among children as reported by their mothers and the levels of indoor home environment, the current study findings revealed that, there was a highly significant relationship between indoor home environment and exposure of the children to home accidents during the last six months as, falling, burn, animal bite and suffocation. $p = 0.001$ **(Table 8).** These findings strongly correlate with **Kamal (2013) and Mohammed et al.**

(2019), who showed that children living in crowded poorly designed or unsupervised homes are at greater risk for domestic accidents. **Abdel-Salam (2022)** emphasized that environmental safety features such as proper storage, ventilation, and structural layout (e.g., secured stairways, separate kitchens) are essential for reducing injury risk in households with young children. These results affirm that improving the indoor home environment not only enhances health but also prevents injury-related morbidity.

Conclusion

Based on the findings of the present study, it can be concluded that, Poor housing conditions, inadequate ventilation, improper waste disposal, and overcrowding contribute the prevalence of physical health problems among children under five years. There was statistically significant relationships between the sanitary level of indoor home environment and the physical health problems among studied under five children such as: (eye and ear infection, respiratory, gastrointestinal diseases, exposure to home accidents, poor skin, and health history of infectious disease, frequent childhood illness as well as thegeneral appearance of children. Socio-demographic factors such as parental education, occupation, and income levels also play a crucial role in determining household sanitary conditions and, consequently, children's health outcomes.In addition, the results emphasize the urgent need for improved housing conditions and greater awareness of home hygiene to promote better child health and well-being.

Recommendations

Based on the results of the present study the following recommendations were suggested

1. Community health nurses should implement community based awareness programs through mass and social media to large sector of community about important of maintaining sanitary and safe indoor home environment, home hygiene and disease prevention to help parents create a healthier environment and foster healthier outcome for their children.
2. Encourage public health campaigns and mass media campaigns to raise awareness among large sectors of community about the impact of indoor home environment on child health.
3. Support regulation on indoor air quality and toxic chemical use in homes and enhance policy decisions regarding public health guidelines aimed to improving the indoor home environment for under five children.
4. Further research needs to assess the effect of indoor home environment on other health aspects of young children.

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