

## ORIGINAL RESEARCH

# Effect of a comic story on orphan children's knowledge and hand washing practice about pandemic of COVID-19

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## ABSTRACT

World Health Organization (WHO) declared COVID-19 as a pandemic in 11<sup>th</sup> of March 2020. COVID-19 that disrupts Children's growth and development, friendships, daily routines and has a negative consequence for their well-being, development and protection. About 1 in 3 children hospitalized with COVID-19 in the United States were admitted to the intensive care unit. *Aim:* The aim of this study was evaluating the effect of a comic story on children's knowledge and hand washing practices about pandemic of COVID-19. *Study design:* A quasi-experimental design was used. *Setting:* Nour Al-Huda Charitable Society that caring males and females orphaned children in separate setting *Sample:* A convenient sample including all children in the orphanage, there was 41 children and their age range between 3 to less than 12 years. *Tools of data collection:* An interview questionnaire sheet as a tool one that had two parts first one concerned with sociodemographic data of children and second one assessed children's knowledge about pandemic of COVID-19, an observational check list sheet as a tool two and had two parts; where part one assessed facilities required for applying precautionary measures inside the home, while part two assessed children's hand washing practice inside the home. *Results:* there was a statistically significant differences between the total children's knowledge regarding COVID-19 and total observed practice score regarding correct technique of hand washing pre/post comic story implementation. *Conclusion:* It was concluded that the implementation of a comic story had improved children's total mean score of knowledge and hand washing practice regarding COVID-19 with statistically significant differences of both in relation to pre and post comic story implementation. *Recommendations:* The study recommended that to breakdown the ring of transmission of COVID-19; the collaboration between governmental and non-governmental agencies and stakeholders are main supporters for those children via appropriate and friendly communication tools that improve their knowledge; practice and also providing those setting by funding and resources for applying precautionary measures of COVID-19 with periodical follow up for personals, setting, services and resources.

**Key Words:** Comic story, Orphan Children's Knowledge, COVID-19, Hand washing practice, Orphanage

## 1. INTRODUCTION

COVID-19 has rapidly spread, becoming the first pandemic of the 21st century by number of deaths over 2,000,000 worldwide in older adults, while in children has a mild clinical presentation and a significantly lower mortality rate.<sup>[1,2]</sup>

According to the Centers for Disease Control and Prevention (2021)<sup>[3]</sup> concluded that 25 from 400 children under 18 years have died from the disease in USA and 0.1% to 1.9% of children who have a positive test of COVID-19 have been hospitalized.<sup>[1]</sup> Droplets infection was the main mode of transition

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and transmission can occur if a person touches an infected surface and then touches his or her eyes, mouth, or nose and droplets typically do not travel more than two meters.<sup>[4]</sup> In children serious complications from COVID-19 may occur as temporary multisystem inflammatory syndrome, respiratory failure in severe cases, myocarditis, shock, acute renal failure, coagulopathy, and multi-organ system failure. Some children with COVID-19 have developed other serious problems like intussusception or diabetic ketoacidosis.<sup>[5]</sup> In addition to the negative effect of quarantine and isolation measures that used to control and prevent spread of COVID-19 consequences for children's well-being.

Children in shelters are high risk for of many infections, as otitis media, gastroenteritis, and viral upper respiratory infections including COVID-19 due to overcrowded living situations, substandard housing conditions, lack access to basic hygiene supplies, and may have difficulty accessing health care, all of which increases their risk of infections.<sup>[6-8]</sup> The best ways to prevent and slow down transmission are handwashing and being well informed about the COVID-19 virus, its causes, mode of transmission and social distance. Negative attitudes and practices against new infectious diseases can exaggerate the epidemics which may finally result in pandemics.<sup>[9]</sup>

To improve personal information about the diseases, a comic, also known as graphic novels or graphic stories, refer jointly to a medium that communicates narrative through the combination of imagery and text.<sup>[10]</sup> In terms of education, comics leverage 'dual coding' theory whereby comprehension and retention of information is improved by inclusion of both visual and text dimensions of information.<sup>[11]</sup> Graphic stories in health sciences are used in enduring outreach and education to help explain disease, diagnoses, exemplify prevention and treatment of the disease, and to change attitudes about disease.<sup>[12]</sup> A study done by Judy et al. (2021)<sup>[13]</sup> found that new information can be represented in the form of children friendly videos, cartoons or audio format so that they are kept well aware of recent developments regarding COVID-19 and 92.86% of the children said they would like to learn more about COVID-19 and 55.1% of them prefer to get information in pictures/video form, while 18.62% opted lectures and information from parents/teachers while 10.84% preferred all the sources. Improving people awareness towards pandemics requiring governmental efforts to increase awareness among societies with lower socioeconomic levels using comics as a one of diverse communication routes.<sup>[14]</sup> Comic art is unconstrained by the rules of reality governing visual media such as photography which allows abstract concepts to be made tangible such as showing coughs spread clouds of infective material which is invisible in life, and

representing the presence of infection and can lists out essential preventive measures such as social distance, greeting in traditional ways, proper hygiene as ways to reduce the risk of getting COVID-19.<sup>[15,16]</sup>

During pandemic of COVID-19 concerns widespread about financial and funding difficulties especially for children in social home care setting whom particularly take their care by governmental and non-governmental organizations and also had insufficient information and hygiene practices and need for mental health support services so they need for greater coordination between stakeholders and various service providers e.g. education, healthcare and social services during pandemic period and healthcare providers carrying on their shoulder the responsibility of education on everyday infection prevention measures.<sup>[17]</sup>

This study aimed to:

- 1) Assess children knowledge and practice related to pandemic COVID-19;
- 2) Assess the availability and applicability of orphans' services precautionary measures related to COVID-19;
- 3) Evaluate the effect of a comic story on children's knowledge and handwashing practices about pandemic of COVID-19.

## 2. SUBJECTS AND METHODS

### 2.1 Study design

Quasi-experimental study design was used.

### 2.2 Setting

Nour Al-Huda Social Care for males and females' orphans' children in two separate setting, licensed under No. 1117 for the care of orphaned children from 3 to less than 12 years old, which lies in the eastern sector of Mansoura City in Dakahlia Governorate, Egypt.

### 2.3 Sample

A convenient sample including all males and females' children in the previous mentioned setting and their number is 41 children and their age range between 3 to less than 12 years.

### 2.4 Tools for data collection

This study had two tools:

- 1) Interview questionnaire sheet that developed by the researchers after reviewing the recent related literatures and has two parts: the first one assessed sociodemographic data of children as age and gender, sources of previous knowledge and practice about COVID-19 etc., and the second one assesses childrens' knowledge about pandemic of COVID-19 as (definition, prevention, manifestation, universal precautions and personal protective barriers, etc.)

2) An observational check list sheet that developed by the researchers after reviewing the recent related literatures and has two parts that assessed:

*Part I:* facilities required for applying precautionary measures inside the orphanage.

*Part II:* childrens' hand washing practice inside the orphanage.

## 2.5 Methodology

**Preparatory Phase:** This phase includes the following:

- An approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Mansoura University to conduct this study.
- An official letter was issued from Faculty of Nursing, Mansoura University to manager of Nour Al-Huda Charitable Society to take permission for carrying out this study.
- The researchers were used a comic story which prepared by postgraduate institute of medical education in India and technically vetted by UNICEF and WHO ; after translating it from English language to Arabic Language by the researcher and this comic story covering the most important information and skills about pandemic of COVID-19.
- The research plan took 2 days for 2 weeks and the researchers were available in the morning shifts for the purpose of data collection.
- The transcript graphic design of the story had talked about three kids, two boys and a girl sitting in their home in front of the TV, and the news talked about pandemic disease called Corona. The kids seems to be panic so the girl call her father to tell them about this disease, but the father does not reply because he was busy at work; the girl told their brothers about a superman who can call him and can answer any questions about this disease.
- The story graphic content covering pandemic of COVID-19 information and skills as (definition , mode of transmission ,manifestation , infection control and universal precautions as handwashing ,social distancing and greeting in traditional ways.
- Pilot study: A pilot study was carried out on 5% of participants in order to evaluate clarity and applicability of the study tools. The needed modifications, additions and omissions were done accordingly.

Participants included in the pilot study were excluded from the sample to prevent contamination of the study results.

### Data collection phases:

Before introducing comic story, assessment phase in the first week of the research plan:

- In the day one every child was interviewed for 10 minutes to answer (Tool I part II) and documented by the researchers

and facilities and applicability of precautionary measures inside the orphan home were assessed by the researchers to identify their needs.

- In the day two ,every child was observed by the researchers for five minutes during applying handwashing practice (tool 2 part II).

A comic story implementation phase in the second week of the research plan:

- The kids were distributed into 4 groups, each group have 10 to 11 children take in consideration precautionary measures.
- The researchers were place the comic story in large poster papers with a colorful copy inside the orphan home conference room.
- The story was introduced in a separate four sessions for the four groups, it took 40 minutes each.
- The researchers cooperated between each other; one introduced purpose and process; and one for debriefing of the story while last turned the story poster pages during telling of the story.
- After finishing all sessions each child took a copy from the colorful comic story in arabic language.
- The researchers provide enough amounts of antiseptic solutions and masks that could facilitate application of precautionary measures inside the home.
- Post implementing a comic story evaluation phase in the second week of the research plan:
  - Every child was interviewed for 10 minutes to answer (Tool I part II).
  - Every child was observed for five minutes during applying handwashing practice (tool 2 part II).
  - Availability and applicability of precautionary measures inside the home were evaluated.

### Scoring system:

- Childrens' knowledge about pandemic of COVID-19 were assessed in (tool I part II) using Health care professionals' knowledge scoring system two mark was awarded for each complete correct answer and one for incomplete correct answer while zero for Incorrect/do not know. According to the researchers' cut off point, the knowledge level is consisted of two categories; unsatisfactory less than 65% and satisfactory more than 65% according to Martín et al.<sup>[18]</sup> Those authors rationalizing that 65% is the level of children under the age of 12 years to understand comprehension.
- Childrens' performance for hand washing were assessed in (tool II part II) ) using check list scoring system: "two mark" will be awarded for each proper complete step "one mark" for incompletely done step and "zero" for improper and not done step. Based on the score; the performance consists of two categories; incompetent performance for missing step of the practice and competent performance for applying all practice steps WHO (2009).<sup>[19]</sup>

### 3. RESULTS

Table 1 revealed that, a total of 41 children constituted the study sample. Male represented 56.1% and the rest were females with mean age 7.92 years. More than three quarters 75.6% of studied children didn't have any previous information regarding COVID-19 as well as hand washing technique.

Table 2 showed children's knowledge about COVID-19 in relation to comic story implementation. As regard to their knowledge about definition of COVID-19, curability from it, methods of prevention and signs & symptoms; it was noticed the majority of them their answers were incorrect or incomplete correct answer pre comic story implementation comparing to correct and complete answer post comic story implementation. A statistically significant differences were observed between studied children's knowledge and comic story implementation (pre/post) where  $p \leq .001$ .

Table 3 described children's observed practice regarding the correct technique of the hand washing where all children didn't demonstrate steps of (wetting hands with water and soap, rubbing the hands well and washing fingers well) pre comic story implementation comparing to above than 90% of them done it completely correct post comic story implementation, while one quadrant 25% of them demonstrated steps of rubbing the big finger, rubbing the hands back and wrist well and rinsing the hands well from the fingertips to the wrist pre comic story comparing to above 85% of them done

those steps completely post comic story implementation. A statistically significant differences were observed between studied children's observed practice regarding the correct technique of the hand washing (pre/post) where  $p \leq .00$ .

**Table 1.** Distribution of socio-demographic characteristics of studied children and source of their previous corona information

Socio-demographic characteristics	N = 41	%
Age		
3-<6 ys	10	24.4
6-<9 ys	14	34.1
9-<12ys	17	41.5
Mean ± SD	7.92 ± 2.84	
Gender		
Male	23	56.1
Female	18	43.9
Do you have information on Virus Corona?		
Yes	10	24.4
No	31	75.6
If the answer is yes, where did you get that information? (N = 10)		
Television	0	0.00
Social media	7	17.1
People who let me know about it inside the department	0	0.00
Did you get Corona's symptoms?		
Yes	0	0.00
No	41	100
If the answer is yes, how are you treated?		
All children did not infect with the virus	0	0.00
Have you been trained on hand washing?		
Yes	10	24.4
No	31	75.6

**Table 2.** Distribution of children's knowledge regarding the COVID-19

Items	Pre-comic story implementation N = 41		Post-comic story implementation N = 41		Test of significance	
	No.	%	No.	%	Z	p
Definition of the corona disease						
Complete correct answer	0	0.00	32	78	7.67	$p \leq .001$
Incomplete correct answer	14	34.1	9	22		
Incorrect/do not know	27	65.9	0	0.00		
Is Corona's disease being curable?						
Yes	2	4.8	41	100	8.57	$p \leq .001$
No	39	95.2	0	0.00		
How can Corona be reduced or prevented?						
Complete correct answer	0	0.00	37	90.2	7.93	$p \leq .001$
Incomplete correct answer	31	75.6	4	9.8		
Incorrect/do not know	10	24.4	0	0.00		
What are the symptoms or signs of Corona?						
Complete correct answer	0	0.00	36	87.8	7.77	$p \leq .001$
Incomplete correct answer	31	75.6	5	12.2		
Incorrect/do not know	10	24.4	0	0.00		
Do you know the precautionary measures?						
Yes	10	24.4	41	100	3.35	$p \leq .001$
No	31	75.6	0.00	0.00		
If the answer is yes, what is it?						
Complete correct answer	14	34.1	37	90.2	5.29	$p \leq .001$
Incomplete correct answer	17	41.5	4	9.8		
Incorrect/do not know	10	24.4	0.00	0.00		

**Table 3.** Distribution of studied children's observed practice regarding the correct technique of hand washing

Items	Pre-comic story implementation N = 41		Post-comic story implementation N = 41		Test of significance	
	No.	%	No.	%	z	p
Wetting hands with water and soap						
Completely done	0	0.00	38	92.7	8.06	$p \leq .001$
Incompletely done	26	63.4	3	7.3		
Not done	15	36.6	0	0.00		
Rubbing the hands well						
Completely done	0	0.00	38	92.7	8.06	$p \leq .001$
Incompletely done	26	63.4	3	7.3		
Not done	15	36.6	0	0.00		
Washing Fingers Well						
Completely done	0	0.00	39	95.1	8.20	$p \leq .001$
Incompletely done	26	63.4	2	4.9		
Not done	15	36.6	0	0.00		
Rubbing the big finger in the right hand and then the left well.						
Completely done	5	12.2	35	85.4	6.67	$p \leq .001$
Incompletely done	21	51.2	6	14.6		
Not done	15	36.6	0	0.00		
Rubbing the hands back well						
Completely done	5	12.2	36	87.8	6.82	$p \leq .001$
Incompletely done	21	51.2	5	12.2		
Not done	15	36.6	0	0.00		
Rubbing the wrist of the right hand and the left well						
Completely done	6	14.6	35	85.4	6.44	$p \leq .001$
Incompletely done	22	53.7	6	14.6		
Not done	13	31.7	0	0.00		
Rinsing the hands well from the fingertips to the wrist						
Completely done	2	4.9	37	90.2	7.53	$p \leq .001$
Incompletely done	24	58.5	4	9.8		
Not done	15	36.6	0	0.00		
Drying hands with clean paper napkins						
Completely done	27	65.9	36	87.8	7.56	$p \leq .001$
Incompletely done	13	31.7	5	12.2		
Not done	1	2.4	0	0.00		

Table 4 illustrated distribution of the availability of precautionary measures within the orphanage in relation to (availability of soap or detergent for hand washing, availability of pads for hand washing and availability of masks); it was cleared that, there was a statistically significant differences between the availability of precautionary measures within the orphanage and comic story implementation (pre/post) where  $p \leq .001$ .

Table 5 described the total studied children's knowledge

and observed practice score regarding the COVID-19. The minority (4.9%) of studied children had a satisfactory knowledge pre comic story implementation comparing to 97.6% post comic story implementation with total mean score ( $3.75 \pm 1.36/9.46 \pm 0.86$ ) pre/post comic story implementation respectively, it was also observed that (2.4%) of studied children had competent practice score comparing to 90.2% of them post comic story implementation with total mean score ( $5.63 \pm 2.23/15.17 \pm 2.10$ ) pre/post comic story implementation respectively. There was statistically significant

differences between the total studied children’s knowledge regarding the COVID-19 and observed practice score regarding the correct technique of the hand washing pre/post comic story implementation where  $p \leq .001$ .

**Table 4.** Distribution of the availability of precautionary measures within the orphanage

Items	Pre-comic story implementation N = 41		Post- comic story implementation N = 41		Test of significance	
	No.	%	No.	%	z	p
Availability of water within the home						
Enough	0	0.00	0	0.00	0.000	1.00
Not enough	41	100	41	100		
Not available	0	0.00	0	0.00		
Availability of water sinks within the home						
Enough	0	0.00	0	0.00	0.000	1.00
Not enough	41	100	41	100		
Not available	0	0.00	0	0.00		
Availability of soap or detergent for hand washing						
Enough	0	0.00	41	100	9.00	$p \leq .001$
Not enough	41	100	0	0.00		
Not available	0	0.00	0	0.00		
Availability of pads for hand washing						
Enough	0	0.00	41	100	9.00	$p \leq .001$
Not enough	0	0.00	0	0.00		
Not available	41	100	0	0.00		
Availability of masks						
Enough	0	0.00	41	100	9.00	$p \leq .001$
Not enough	41	100	0	0.00		
Not available	0	0.00	0	0.00		
The degree to which precautions are available within the community.						
Available and enough	0	0.00	0	0.00	0.000	1.00
Available but not enough	41	100	41	100		
Unavailable	0	0.00	0	0.00		
Are the precautions were applied in the house?						
Yes, fully applied	0	0.00	0	0.00	0.000	1.00
Partially applied	41	100	41	100		
Do not applied	0	0.00	0	0.00		
If the answer is no, what are the reasons why it can't be applied?						
Water outage and absences of masks	31	75.6	0	0.00	5.09	$p \leq .001$
Water outage and absence of sterilizers	9	22	0	0.00		
Water outage	1	2.4	41	100		

Figure 1 illustrated the total studied children’s knowledge level regarding COVID-19, the majority (95.1%) of studied children had unsatisfactory knowledge level pre comic story implementation comparing to satisfactory level (97.6%) in the post comic story implementation.

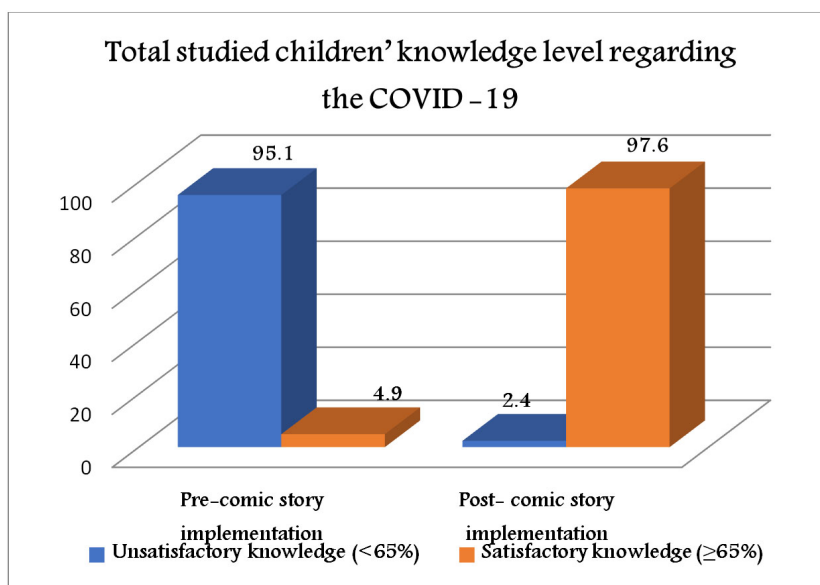
Figure 2 illustrated the total studied children’s observed practice level regarding the correct technique of the hand washing, it was observed that the majority (97.6%) of studied children

had incompetent practice level pre comic story implementation comparing to competent practice level in 90.2% of them in post comic story implementation.

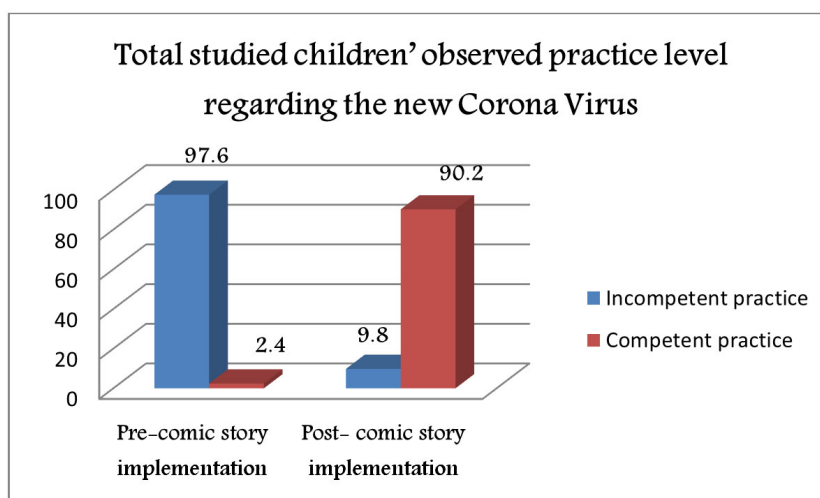
Table 6 showed that there was a statistically significant differences between the total children’s knowledge regarding COVID -19 and total observed practice score regarding correct technique of hand washing pre/post comic story implementation, where  $p \leq .001$ .

**Table 5.** Distribution of the total children’s knowledge regarding COVID-19 and total observed practice score regarding correct technique of hand washing pre/post comic story implementation

Time of Comic implementation Total score of knowledge and practice	Pre-comic story implementation N = 62		Post- comic story implementation N = 62		Test of significance	
	No.	%	No.	%	t	p
The total knowledge score (10 scores)						
Unsatisfactory knowledge (< 65%)	39	95.1	1	2.4	16.32	p ≤ .001
Satisfactory knowledge (≥ 65%)	2	4.9	40	97.6		
Mean ± SD	3.75 ± 1.36		9.46 ± 0.86			
The observed practice score (16 scores)						
Incompetent practice	40	97.6	4	9.8	14.78	p ≤ .001
Competent practice	1	2.4	37	90.2		
Mean ± SD	5.63 ± 2.23		15.17 ± 2.10			



**Figure 1.** Total studied children’ knowledge level regarding COVID-19



**Figure 2.** The total studied children’s observed practice level regarding the correct technique of the hand washing

**Table 6.** Correlation between the total children’s knowledge regarding COVID-19 and total observed practice score regarding correct technique of hand washing pre/post comic story implementation

Children’s hand washing score	Total studied children’s knowledge score about COVID-19			
	Pre-comic story implementation N = 41		Post-comic story implementation N = 41	
	r	p	r	p
Total observed children’s hand washing score	0.599**	p ≤ .001	0.682**	p ≤ .001

\* Statistically significant at p ≤ .05

**Table 7.** Correlation between the total children’s knowledge regarding COVID-19 and total observed practice score regarding correct technique of hand washing with availability of precautionary measures pre/post comic story implementation

Item	The availability of precautionary measures			
	Pre-comic story implementation N = 41		Post-comic story implementation N = 41	
	r	p	r	p
Total studied children’ information score	0.178	.267	0.219	.168
Total studied children’ observed practice score	0.036	.824	0.299	.057

\* Statistically significant at p ≤ .05

Table 7 described that there were no statistically significant differences between the total children’s knowledge regarding COVID-19 and total observed practice score regarding correct technique of hand washing with availability of precautionary measures pre/post comic story implementation.

Table 8 showed that there was no statistically significant difference between the total children’s knowledge level regarding COVID-19 and studied children’s age and gender pre/post comic story implementation.

**Table 8.** Association of children’s age and gender and their total knowledge level regarding COVID-19 pre/post comic story implementation

Children’s age and gender	Children’s level of knowledge/comic story implementation	Pre-comic story implementation N = 41				Post-comic story implementation N = 41				Test of Significance Exact tests			
		Unsatisfactory knowledge N = 39		Satisfactory knowledge N = 2		Unsatisfactory knowledge N = 1		Satisfactory knowledge N = 40		Pre		Post	
		No.	%	No.	%	No.	%	No.	%	χ <sup>2</sup>	p	χ <sup>2</sup>	p
		Child age	3-<6 ys	10	24.4	0	0.00	1	2.4	9	22	MC	.165
	6-<9 ys	12	29.3	2	4.9	0	0.00	14	34.1				
	9-<12ys	17	41.5	0	0.00	0	0.00	17	17				
Gender	Male	21	51.2	2	4.9	0	0.00	23	56.1	FE	.459	FE	.439
	Female	18	43.9	0	0.00	1	2.4	17	41.5				

\* Statistically significant at p ≤ .05, MC: Monte Carlo test, FE: Fisher exact test

Table 9 showed association between studied children’s characteristics and their total observed practice level regarding correct technique of hand washing, it was cleared that there

was a statistically significant difference between studied children’s age with their total practice level pre/post comic story implementation, where p = .048.

**Table 9.** Correlation between children’ age and gender with their level of hand washing practice in relation to pre and post comic story implementation

Children’ age and gender	Hand washing And comic implementation	Pre-comic story implementation N = 41				Post-comic story implementation N = 41				Test of Significance Exact tests			
		Incompetent practice N = 40		Competent practice N = 1		Incompetent practice N = 4		Competent practice N = 36		Pre		Post	
		No.	%	No.	%	No.	%	No.	%	χ <sup>2</sup>	p	χ <sup>2</sup>	p
		Child age	3-<6 ys	10	24.4	0.00	0.00	3	7.3	7	17.1	MC	1.00
	6-<9 ys	14	34.1	0.00	0.00	0.00	0.00	14	34.1				
	9-<12ys	16	39	1	2.4	1	2.4	16	39				
Gender	Male	23	56.1	0.00	0.00	2	4.9	21	51.2	FE	.439	FE	1.00
	Female	17	41.5	1	2.4	2	4.9	16	39				

\* Statistically significant at p ≤ .05, MC: Monte Carlo test, FE: Fisher exact test



## Data analysis

All statistics were calculated with Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA), version 20 for Windows. Descriptive statistics were calculated to describe the sample background characteristics. Categorical variables were described using number and present. Continuous variables were presented as mean  $\pm$  SD (standard deviation). The Kolmogorov–Smirnov test was used to test the normality of the distribution of the continuous variables. For normally distributed variables, Paired sample *t*-test was used to indicate differences between before and after comic story implementation mean scores. While for not normally distributed variables, Wilcoxon signed rank test was used to indicate difference between related groups mean ranks. Monte Carlo and Fisher's exact test were used to check whether the variables are independent of each other or not, as the chi square criteria for application wasn't met. All tests performed at a level of significance (*p*-value) equal or less than .05 was statistically significant.

## 4. DISCUSSION

The new coronavirus disease 2019 (COVID-19) has grown into a pandemic so persons around the world should take urgent measures to control the spread of the virus.<sup>[20]</sup> With the pandemic children's fears, level of stress and xenophobia toward the disease, exposure to abuse, financial insecurity, domestic violence, criminal exploitation or sexual exploitation and neglect were increased specially in high risk children whom lining in shelters. The pandemic has also led to increased children demands for certain services as resources availabilities to provide health information and hygiene items for children which can be covered by greater coordination between various service providers (e.g. education, healthcare and social services) during lockdown.<sup>[21]</sup> Misinformation and a lack of information during a health crisis can spread paranoia, fear, and stigma, and result in people not being protected and the disease may spread.<sup>[22]</sup> Negative attitudes and practices against new infectious diseases can exaggerate the epidemics which may finally result in pandemics.<sup>[23]</sup> In response to the current pandemic, child psychologists and health scientists have joined forces with, educators, artists and writers to produce innovative communication materials which ranged from children's books, videos to infographics and comics. Comics and cartoons are a powerful way to teach kids about COVID-19.<sup>[24,25]</sup>

Shaikh and Likhite (2020)<sup>[26]</sup> found that 92.86% of the children have no information about COVID-19 and 25% of children get this information from social media and this result in agreement with the present study where 75.6% from studied children had no information and 17.1% of them their

information about COVID-19 were taken from social media. Regarding children training in hand hygiene, Chen et al. (2020)<sup>[27]</sup> found that the majority 92.05% of the primary school children trained in hand-washing which in contrary with our study where the minority to be 24.4%, and also, many conferences done in Europe (2020)<sup>[28]</sup> recommended that child-friendly explanations on hygiene measures during COVID-19 health crisis reduced children fear and anxiety and this results conflicted with the present study where 75.6% from the children didn't trained on handwashing practice that may exposure them for fear and anxiety (see Table 1).

Cileins and Nethme (2020)<sup>[29]</sup> said that comics have been used as a vehicle to present science in graphic narratives, harnessing the power of visuals, text, and storytelling in an engaging format and considered as a public health tool during the COVID-19 pandemic. Aleixo and Sumner (2017)<sup>[30]</sup> illustrated that comics leverage 'dual coding' theory whereby comprehension and retention of information is improved by inclusion of both visual and text dimensions of information and this result in agreement with the present study where children's information about COVID-19 (definition, prevention and signs & symptoms) all of them didn't have complete correct answer before implementation of comics story comparing to more than two third of them had complete correct answer after comics story implementation Table 2. Regarding children awareness about curability from COVID-19 the present study found that only 95.2% from children said no while Shaikh and, Likhite (2020)<sup>[26]</sup> disagree with our study where 84% of children said yes (see Table 2). Shehata et al. (2021)<sup>[21]</sup> found that children awareness about the risk of disease transmission, the common clinical presentations and the preventive measures of COVID-19 was good and this result in conflict with the results of the present study where the majority of children 95.1% had unsatisfactory knowledge level about previous mentioned items. Precautionary measures are the most important preventive approach against COVID-19 but in the current study only 24.4% from studied children recognized it Table 2 but this result was not in the same line with Shaikh and Likhite (2020)<sup>[26]</sup> who reported that more than 90% of school student aware about Precautionary measures and the rational returned to the participants said they gain it from TV, social media and from their family members comparing to our participants who gained it from social media and they are lockdown in the orphanage.

Regarding handwashing practice in table 4 and children's information and observed practice score regarding the COVID-19 in Table 6, our study found that the majority of the participants applying steps of handwashing incompletely/incorrect before comics story implementation comparing to the majority of them applying the steps completely and correct

after comic story and this result in same line with Gillies et al. (1990)<sup>[31]</sup> who found that an educational comic about AIDS improved knowledge and attitudes levels post-comic testing in the experimental group compared to those who did not receive the resource and also with Callender et al. (2020)<sup>[32]</sup> who explored that the comics stories improve participants knowledge, practice and behavior about COVID-19 and comics play an important role in reducing the spread of COVID-19.

As shown in Table 6, the current study revealed that children's information score level and handwashing practice score level about COVID-19 was unsatisfactory and incompetent but this result incongruity with a satisfactory level of information and competent handwashing practice as in study done by Chen et al.(2020).<sup>[27]</sup>

Our study found that comic implementation improved children score level of knowledge and practice about COVID-19 as in Table 6 &7, which in close agreement with findings of Aleixo and Sumner (2017)<sup>[30]</sup> who illustrated that comics improved knowledge ,attitude and practice of personal toward COVID-19 also Delp and Jones(1996)<sup>[33]</sup> found that comics improved participants knowledge and practice about wound care in emergency department.

Beharry and Christensen (2020)<sup>[34]</sup> said that homeless children may live in substandard housing conditions, may lack access to basic hygiene supplies as water supplies disinfectant solutions, may have other material hardships as food insecurity, and may have difficulty accessing health care, all of these factors increasing their risk of infections including COVID-19 and this result in agreement with the present study where basic hygiene supplies neither available nor enough but precautionary measures were partially available and applicable as in Table 5.

A study done by Coughlin et al. (2020)<sup>[35]</sup> who concluded that COVID-19 pandemic rising unemployment, increased financial stressors, and increased illnesses increasing morbidity and mortality rates of shelters home children and it is the responsibility of governmental and non- governmental agencies and voluntaries periodically to support and meet needs and finances of those group and this result in the same line with the present study where the researchers assessed

availability of resources as masks and antiseptic solutions and health educational needs which improved after comic implementation and researchers voluntary providing the shelter home by masks and antiseptic solution while water supply should be issued by Ministry of Social Solidarity (see Table 5).

Our results using Monte Carlo and fisher's exact test were used to check whether the variables are independent of each other or not where there no significantly association between gender with level of children' knowledge about COVID-19 pre and post comic implementation (see Table 9) and this result contrary with studies in Malaysian and Saudi Arabia indicated that females had more knowledge regarding COVID-19 than males.<sup>[36-38]</sup> In addition to handwashing practice in the present study illustrated that competent practices of handwashing associated significantly with age above 6 years old children pre and post comic implementation as in Table 10 and this result in in agreement with Saeed et al.<sup>[38]</sup> who found that demonstration and application of hand washing practice can be improved after using comic story for children aged more than 6 years.

## 5. CONCLUSION AND RECOMMENDATION

This study concluded that implementation of comic story not only improved orphaned children's knowledge about COVID-19 but also improved their practice of precautionary measures as competent hand washing practice, using appropriate social distance and demonstrating proper ways of greeting in their daily life activities. Recommendations from this study were depending on consideration of orphaned children and the orphanage settings as risk groups and settings that may increase pandemic of COVID-19 transmission; to breakdown the ring of transmission the collaboration between governmental and non-governmental agencies and stakeholders are the main supporters for those children via appropriate and friendly communication tools that improve their knowledge; practice and also providing those setting by funding and resources required for applying precautionary measures of COVID-19 with periodical follow up for personals, setting, services and resources.

## CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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