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The Effect of Makassar Folk Music on Cerebral Hemodynamics Measured by Transcranial Doppler

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Abstract
This study aimed to evaluate the effect of Makassar folk music on cerebral hemodynamics using transcranial doppler (TCD). This was an experimental study with a pre- and post-test design. The study was conducted on 30 subjects at the Sonology clinic of Wahidin Sudirohusodo Hospital, Makassar from August to September 2019. The subjects listened to either rock, classical, or Makassar folk music and cerebral hemodynamic parameters before and after listening were assessed using TCD. The results of the study show that there were significant changes in both the left and the right middle cerebral artery (MCA) mean flow velocity (MFV) after listening to three genres, with a p-value < 0.0001 for each genre. There was no significant difference between the changes observed in left MFV MCA compared to the one on the right side. The value of MFV change was not significantly different across genres. The results indicate that Makassar folk music has the same effect on increasing cerebral hemodynamics as classical music and rock music.

Keywords: Cerebral Hemodynamics, Mean Flow Velocity, Music, Transcranial Doppler

1. Introduction

The relationship between music and brain function is increasingly investigated in modern neuroscience. More evidence points to a close relationship between brain activity, cerebral blood flow, and metabolism, implying that tasks requiring cognitive activation, such as listening to music will affect the blood flow velocity of cerebral arteries, particularly within regions involved in musical perception. Increased cerebral blood flow rate reflects higher brain metabolism activated by cognitive, motor, and sensory tasks. Music is known to induce and modify cognitive, mental, and emotional states. The act of listening to music results in the extensive activation of neural networks in the human brain, and has been regarded as a potential treatment option for psychological and neurological diseases (Antić et al., 2012; Hsu & Lai, 2004; Osuch et al., 2009).

In the past decade, a growing body of evidence on the use of music interventions in clinical practice has emerged, through singing, listening to music, music improvisation, and structured music therapies. Given that music involves multiple brain regions that regulate emotion, motivation, cognition, and motor function, musical

interventions have been proposed with the aim of improving socialization, cognitive and motoric function, and emotional state (Chanda & Levitin, 2013; Koelsch, 2010; Raglio et al., 2015). Clinical investigations into the effect of music on the recovery process have shown a clear relationship between music and improved post-stroke recovery. Benefits that have been reported are in terms of muscle or movement control, speech, cognition and mood recovery. Music listening stimulates multiple brain structures and improves brain circulation. For this reason, it is a potentially useful tool in the neurological rehabilitation of post-stroke patients (Antić et al., 2012).

Cognitive activities such as listening to music can impose metabolic alterations in specific cortical centers, that lead to changes in the velocity of blood flow in the large cerebral arteries, which is considered as a manifestation of cognitive activity. Therefore, the increase of cerebral blood flow rate is a reflection of an upregulated brain metabolism triggered by motor, sensory, or cognitive function activities such as listening to music (Antić et al., 2012; Vingerhoets & Stroobant, 1999).

Changes in the velocity of cerebral blood flow during and following cognitive activity can be assessed by transcranial doppler (TCD). For more than two decades, TCD has been used as an assessment method for characterization of cerebral hemodynamics. Commonly evaluated parameters include mean flow velocity (MFV) due to cognitive activation. In addition to being non-invasive, the advantages of functional TCD are that they are inexpensive, do not require special preparation, accurate, specific and sensitive for direct evaluation of cerebral blood flow dynamics and are easy to carry (for portable TCDs) (Antić et al., 2006).

Cerebrovascular hemodynamics refers to the relationship between blood flow, perfusion pressure, and resistance. The main principle of cerebrovascular hemodynamics is based on Ohm's law, where cerebral blood flow is defined as cerebral perfusion pressure (CPP) divided by cerebrovascular resistance (CVRes). Factors that influence cerebral perfusion include cerebral perfusion pressure, arterial blood pressure (ABP), intracranial pressure (ICP) and cerebrovascular resistance, all of which are determined by the functional status of arteriolar blood vessels within the cerebral microcirculation. Hence, the analysis of cerebral blood flow is considered as one of the most effective cerebral perfusion assessment methods (Schöning et al., 2005; Valdueza, 2017).

Previous studies have shown that in healthy individuals, music perception and processing requires bilateral activation of the cerebral hemispheres (Antić et al., 2006), as evidenced by the increase in cerebral blood flow during music listening in both sides of the brain. However, most studies that assessed music-related cerebral hemodynamic changes only used classical music as the research material (Carod Artal et al., 2004; Marinoni et al., 2000; Vollmer-Haase et al., 1998). Although folk music is not as widely studied, folk music in many communities can have different emotional and social implications that may affect cerebral blood flow. Hence in this study, we aimed to determine whether there is an influence of Makassar folk music on changes in cerebral hemodynamics measured by TCD, on subjects of the local Makassar area. The changes imposed by the folk music were compared with other genres such as rock and classical music.

2. Material and Method

2.1. Time and location

The study was carried out from August 2019 to September 2019 at the Sonology Outpatient Clinic, Dr. Wahidin Sudirohusodo Hospital Makassar Indonesia. Consecutive sampling was performed on subjects that consisted of local medical students and residents at the Faculty of Medicine Hasanuddin University who have consented to participate in the study.

2.2. Data Collection

This is an experimental research with a pre-test and post-test design. The cerebral hemodynamics were assessed before and after listening to three different genres. The cerebral hemodynamic parameters include MFV and middle cerebral artery (MCA). The three genres consisted of classical music (*Canon in D*), folk music (*Turiolo Jenetallasa* local orchestra), and rock music (*We will rock you*).

Cerebral blood flow parameters were measured using the Transcranial Doppler DWL Digital Multi-Dop® X-type, and the music was administered using the Huawei Honor 8x Cellphone and HTC earbud type headset. Other collected data include patient characteristics obtained from the medical status and respondent form. All participants provided their informed consent prior to the data collection. Prior to commencement, the study has obtained ethical approval from the Ethics Board at the Faculty of Medicine, Hasanuddin University (Ethics Number: 584/UN4.6.4.5.31/PP36/2019).

2.3. Data Analysis

The collected data were processed through statistical analysis using SPSS version 22. In order to see the comparison between the two groups, paired T-test and students T-test was used to measure differences between the means of two groups of paired and unpaired data. One-way ANOVA was used to determine the difference between the means of 3 groups or more. A threshold of $p < 0.05$ was considered significant.

3. Results

A total of 30 subjects were included in this study, and consisted of 14 males (46.7%) and 16 females (53.3%). The subjects were randomly divided into 3 groups consisting of 10 subjects per group in the classical music, folk music and rock music groups. Tabel 1 presents the age characteristics of the 30 subjects, showing similar age ranges across groups.

Table 1: Characteristic of the study subject

Age characteristics of subjects in each group		
Treatment group	N (%)	Mean age (SD)
Classical music group	10 (33.3%)	30.30 (5.67)
Folk music group	10 (33.3%)	28.30 (3.19)
Rock music group	10 (33.3%)	29.00 (6.16)

The average left MCA MFV value before listening to music was 63.90 ± 10.025 cm/s and 64.97 ± 9.023 cm/s for the right MCA MFV. Table 2 shows changes in the left MCA MFV of the classical music group before and after listening to music. Prior to the classical music treatment, subjects showed a mean MFV of 67.7 ± 11.18 in the left MCA, which increased into an MFV of 81.70 ± 11.66 after listening to classical music. In the right MCA, the subjects yielded an average MFV of 68.7 ± 10.10 before the music treatment and 81.10 ± 12.76 after the classical music treatment. The changes in both the left and right MCA before and after the classical music treatment was statistically significant ($p<0.0001$, paired t-test), with a mean ΔMFV of 14 ± 4.19 and 12.4 ± 3.37 in the left and right and MCA correspondingly.

Similar results were observed in the folk music group. Prior to the folk music treatment, subjects showed a mean MFV of 62.9 ± 10.19 in the left MCA, which increased into an MFV of 75.9 ± 10.96 after listening to folk music. In the right MCA, the subjects yielded an average MFV of 62.6 ± 8.51 before the music treatment and 76.00 ± 10.89 after the folk music treatment. The ΔMFV in the left MCA was 13 ± 2.35, and 13.40 ± 3.40 in the right MCA. In the rock music group, subjects showed a mean baseline MFV of 61.1 ± 8.30 in the left MCA, which increased into an MFV of 73.30 ± 8.94 after listening to rock music. In the right MCA, the subjects yielded an average MFV of 63.60 ± 8.00 before the music treatment and 76.90 ± 9.50 after the rock music treatment. The ΔMFV was similar ($p <0.442$, students T-test) in the left MCA (12.20 ± 2.89) and the right MCA (13.30 ± 3.36).

Table 2: Changes in the MFV values of the left and right MCA before and after listening to classical music

MFV MCA Changes in Classical Music		
Parameter	Mean (SD) of MFV (cm/s)	P-value
Left MFV MCA (n = 10)		
Before	67.70 (11.18)	$< 0.0001^{\#}$
After	81.70 (11.66)	
Right MFV MCA (n = 10)		
Before	68.70 (10.10)	$< 0.0001^{\#}$
After	81.10 (12.76)	
ΔMFV MCA (n = 10)		
Left	14.00 (4.19)	0.355*
Right	12.40 (3.37)	
# indicates p-values calculated with the paired T-test, * indicates p-values calculated with the student's T-test, MFV = mean flow velocity, MCA = middle cerebral artery		

Table 3: Changes in the MFV values of the left and right MCA before and after listening to folk music

MFV MCA Changes in Folk Music		
Parameter	Mean (SD) of MFV (cm/s)	P-value
Left MFV MCA (n = 10)		
Before	62.90 (10.19)	$< 0.0001^{\#}$
After	75.90 (10.96)	
Right MFV MCA (n = 10)		
Before	62.60 (8.51)	$< 0.0001^{\#}$
After	76.00 (10.89)	
ΔMFV MCA (n = 10)		
Left	13.00 (2.35)	0.7631*
Right	13.40 (3.40)	
# indicates p-values calculated with the paired T-test, * indicates p-values calculated with the student's T-test, MFV = mean flow velocity, MCA = middle cerebral artery		

Table 4: Changes in the MFV values of the left and right MCA before and after listening to rock music

MFV MCA Changes in Rock Music		
Parameter	Mean (SD) of MFV (cm/s)	P-value
Left MFV MCA (n = 10)		
Before	61.10 (8.30)	$< 0.0001^{\#}$
After	73.30 (8.94)	
Right MFV MCA (n = 10)		
Before	63.60 (8.00)	$< 0.0001^{\#}$
After	76.90 (9.50)	
ΔMFV MCA (n = 10)		
Left	12.20 (2.89)	0.442*
Right	13.30 (3.36)	
# indicates p-values calculated with the paired T-test, * indicates p-values calculated with the student's T-test, MFV = mean flow velocity, MCA = middle cerebral artery		

The differences in ΔMFV between the 3 groups were further analyzed, and Table 3 shows that there was no significant difference in the ΔMFV between all three music genres, in both the left ($p = 0.471$, one-way ANOVA) and the right MCA ($p = 0.769$, one-way ANOVA).

Table 5: Comparison between the ΔMFV in classical, folk, and rock music groups.

Music group	ΔMFV of the left MCA		p-value	ΔMFV of the right MCA		p-value
	Mean	SD		Mean	SD	
Classical music	14.00	4.19		12.40	3.37	
Folk music	13.00	2.35	0.471	13.40	3.406	0.769
Rock music	12.20	2.89		13.30	3.368	
P-values calculated with one-way ANOVA. MFV = mean flow velocity, MCA = middle cerebral artery						

4. Discussion

This study was conducted to compare the effect of Makassar folk music with classical and rock music towards cerebral hemodynamics measured using transcranial doppler. The 3 types of music were chosen because rock music represents diatonic music, while classical and folk music represent pentatonic music. The average age of the subjects were 29.20 years, in line with previous observations by Antić et al (Antić et al., 2006) that looked at changes in cerebral hemodynamics during music perception in 61 subjects with an average age of around 30.8 years, and by Artal et al (Carod Artal et al., 2004) with an average age of 31.7 years. The average left and right MCA MFV value before listening to music was 63.90 ± 10.025 cm/s and 64.97 ± 9.023 cm/s, respectively. These results indicate that the MCA MFV value in our study subjects before listening to music was comparable to the normal value of MCA MFV of the 10-29 and and 30-49 year age group which are 70 ± 16.4 cm/s and 57 ± 11.2 cm/s, respectively (Csiba & Baracchini, 2016).

The changes in the MCA MFV before and after listening to music in all three music groups were statistically significant ($p < 0.0001$) in both the left and right MCA. Matteis et al (Matteis et al., 1997) reported the same observation, where there was a significant increase in MFV during listening to music compared to before listening to music. In line with the finding, Artal et al reported that sound stimulation stimulated a significant increase in MFV in the ipsilateral MCA compared to MFV at rest. This is consistent with previous theories which highlight that cognitively stimulating activities such as listening to music will induce metabolic changes in the form of increased CO_2 within specific cortical centers, leading to changes in blood flow velocity in the large cerebral arteries. In other words, the increase in cerebral blood flow velocity is a reflection of upregulated brain metabolism triggered by motor, sensory or cognitive function activities such as listening to music (Antić et al., 2012; Vingerhoets & Stroobant, 1999).

Activities that require neural activation such as listening to music demands an increase in cerebral blood flow which subsequently leads to cerebral arteriolar vasodilation and decreased vascular resistance to ensure adequate perfusion, a phenomenon known as cerebral vasomotor reactivity (CVR). A lack or significantly decreased CVR reflects impaired ability of cerebral vessels to adjust its caliber to vasodilator stimuli, and abnormal CVR has shown a high risk of stroke occurrence and recurrence (Rossini et al., 2004). Causative factors may include barotrauma from systolic pressure waves, low cerebral blood flow that leads to hypoperfusion, or impaired cerebrovascular capacity to adapt to sustained changes in blood pressure. Some vasodilator agents such as calcium channel blockers can enhance dynamic cerebrovascular function without affecting resting blood flow (Webb, 2019).

No significant difference was observed between changes in the left and right MCA MFV of the folk music group, similar to the classical and rock music groups. This is in line with the findings of Matteis et al (Matteis et al., 1997)

who reported that during melody perception, a bilateral increase in MFV in the middle cerebral arteries was seen. Similar findings were reported by Artal et al (Carod Artal et al., 2004) who found that auditory stimulation in the form of instrumental music significantly stimulated blood flow velocity in the ipsilateral middle cerebral artery compared with the absence of auditory stimulation. It is suspected that a musical perception requires bilateral cerebral hemisphere activation. Vollmer-Haase et al (Vollmer-Haase et al., 1998) suggested that subjects who did no other task than passively listening to music exhibited a symmetrical increase in blood flow velocity, indicating balanced cerebral activation hemispheric activation bilaterally. This was also reported in the study by Antić et al (Antić et al., 2006) who observed that music perception requires bilateral cerebral hemisphere activation. Current studies have shown the activation of Broca's area during tasks other than language production. Many other studies report the involvement of these areas in the comprehension process of languages, action execution, as well as music perception and execution (Wang & Agius, 2018), where those statements further confirm the results of our study which showed that listening to music involves both hemispheres of the brain.

There was no statistically significant difference in both the right ($p = 0.769$) and left ($p = 0.471$) MCA MFV changes between the three study groups. The act of listening to music is a complex process, and requires multi-aspect involvement of psychological, emotional, and neurological systems. It can also lead to cardiovascular changes and modification of respiratory behavior. Whilst non-musicians typically utilize the non-dominant hemisphere of the brain, musicians use the dominant hemisphere and are typically more attentive when listening to music. This response influenced by the type of music (e.g., classical versus rock), and the melodic composition of the musical piece, in addition to the harmony, tempo, and rhythm. It is also highly influenced by verbal content wherein there appears to be asymmetry of brain activity shown for perception of language and melody but not found in perception of rhythm (Bernardi et al., 2006). The results obtained in our study suggest that the music we use has almost similar characteristics so that the differences in left and right MCA MFV changes between the three musical groups are not significant.

Music as a form of neurological rehabilitation is increasing. It has been shown that music training may lead to changes in brain structure and function, because the act of listening or performing music is known to activate not only cognitive but also motor function in healthy individuals. This may trigger neuroplasticity and promote cognitive as well as motor recovery after brain injury or disease. Actively playing and passively litening to music is known to influence rehabilitation and lead to neuroplasticity changes (Merrett & Wilson, 2012).

Listening to music improves post-stroke cognition and mood, and improve early sensory processing. In post-stroke patients who listened to music daily for two months, the amplitude of auditory mismatch negativity (MMN) for sound frequency changes was greater than the control group who did not listen to music. And although passive music listening itself is beneficial, active music execution and practice is an even more effective rehabilitation tool, particularly when targeting the motor domain. In a study on patients with movement deficits, the use of MIDI-tuned drums and keyboards to train gross and fine motor movements of the upper limbs have led to increased movement scores and changes in oscillatory neural activity related to stroke incidence compared to controls (Altenmuller et al., 2009). There are several mechanisms that have been proposed to explain this effect, and one of the most prominent is that music provides auditory feedback on motor movement and promotes audio-motor coupling (Rickard & McFerran, 2012).

The findings discussed in this study provides an interesting addition to the current body of knowledge on music-induced plasticity. The experience of listening to or playing music is typically perceived as pleasant and interesting for patients with neurological disorders. With these experimental findings, in combination with the known capacity of music to induce neuroplasticity, further exploration is warranted for the use of music therapy as a highly potential treatment option for neurological disorders. In conclusion, the results of this study indicates that Makassar folk music has the same effect on increasing cerebral hemodynamics as classical music and rock music.

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Risk Communication and Community Attitude to Corona Virus Disease 2019 Outbreak in Southwestern Nigeria

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Abstract
Background: The global community is racing to slow down and eventually halt the spread of COVID-19. The success of the ongoing battle against this pandemic all over the world depends on community knowledge and perception. The objective of this study was to assess risk communication, knowledge and community attitudes to COVID-19 outbreaks in southwestern Nigeria. Methods: Community based descriptive cross-sectional study of risk communication, knowledge and community attitude to COVID-19 prevention and control among 1200 community persons selected using multistage sampling methods. Research instrument was a semi-structure interviewer administered questionnaire, and data analyzed using the IBM SPSS software version 23.0. Findings: Mean age of respondents was 36.0 ± 12.1 years, 735 (61.3%) were females and 465 (38.8%) were males. Majority of the respondents (97.5%) had heard about COVID-19, with the radio (65.2%) and television (60.4%) being the major sources of information. Only 455 (37.9%) think that they can get COVID-19, 738 (61.5%) said they were ready to willingly observe staying indoors or lockdown, only 525 (43.8%) have been putting on face mask. Respondents with good knowledge of COVID-19 transmission, symptoms and prevention were 39.6%, 88.7% and 94.5% respectively, while for good perception towards COVID-19 was 72.2%. Predictors of good knowledge of transmission and symptoms of COVID were respondents being above 19 years, being a male and having education level above secondary school. Predictors of good knowledge and perception of prevention and control measures of COVID were respondents being above 19 years, being a female and having education level above secondary school. Conclusion: Good awareness and poor knowledge of COVID-19 transmission, but good knowledge of prevention and good perception were reported among communities in Southwestern Nigeria. Only few believed they could get the disease. This calls for enlightenment campaign and good communication messages directed at the general population.

Keywords: COVID-19, Risk Communication, Misconception, Knowledge and Prevention, Southwestern Nigeria

1. Introduction

The world is facing one of the worst experiences of a pandemic in several decades, as a new corona virus ravages hard and fast to consume humanity. It is a public health emergency of international concern. Significant mortality and morbidity have been recorded, with huge losses to the world economy. Corona Virus Disease (COVID-19) is one of the several emerging disease of public health importance, others related include the SARS –CoV, H1N1 and MERS-CoV outbreaks of 2003, 2009 and 2013 respectively. The outbreak was first reported by the Chinese health authority to the World Health Organization (WHO) in 2019 as unexplained disease causing flu - like illness with potential respiratory difficulty and high mortality.

The case studies of COVID-19 published in the New England Journal of Medicine (NEJM) on January 29, 2020, encapsulates the first 425 cases recorded in Wuhan. (Li et. al., 2020) Data indicate that the patients' median age was 59 years, with a range of 15 to 89 years. Thus, they reported no clinical cases in children below 15 years of age. There were no significant gender differences (56% male). As of the end of March 2020, a total of 151 cases of COVID-19 were confirmed in Nigeria with 9 hospital discharges and 2 deaths. (Nigerian Center for Disease Control [NCDC], 2019)

The evidence of human-to-human transmission was confirmed among close contacts. (Li et. al., 2020) The epidemic was greeted with several myths and misconceptions about the infection, amidst high media coverage and awareness among community members relating to causes, mode of transmission and prevention and control of COVID-19.
In January 2020, the outbreak was declared by the WHO a Public Health Emergency of International Concern (PHEIC). The CoVs have become the major pathogens of emerging respiratory disease outbreaks. They are a large family of single-stranded RNA viruses (+ssRNA) that can be isolated in different animal species. (Huang et. al., 2020) At the moment, the therapeutic strategies to deal with the infection are only supportive, and prevention aimed at reducing transmission in the community is the best weapon.

The Nigerian Government has announced a number of measures that could mitigate or contain the spread of the epidemic since there is no known cure or effective treatments. Major preventive measures such as wearing of mask, regular hand washing, use of sanitizers among others have to do with the communities. How well the communities can act to prevent spread would depend on their risk communication level and strategies. Taking one recommended action or the other requires full compliance with such provisions, and also requires that these decisions and recommendations be communicated to the community and reinforced. This study therefore assessed risk communication, knowledge and community attitudes to COVID-19 outbreaks in southwestern Nigeria

2. Materials and Methods

2.1. Study area

The study area is Southwestern Nigeria with a population of about 19 million people distributed among six states. COVID 19 has been reported in all the states. Each has their isolation center in preparation for potential outbreaks. There are numerous secondary and tertiary level health facilities for the treatment of COVID-19 within the study area. Lagos State host the first and the largest international airport while some of the States have their respective local airports that are potential entry point for imported COVID-19 cases.

2.2. Study designs

Community based descriptive cross-sectional study to assess risk communication, knowledge and community attitude to COVID-19 in Southwestern Nigeria.

2.3. Study population

All individuals or community members aged 18 years and above who are living in specified communities for at least a period of six months. Health care workers and state technical team members in charge of managing COVID-19 outbreak were excluded from this study in order not to introduce bias of knowing the answers already

2.4. Sample size calculation

Was calculated using the modified Leslie Fishers formula for calculation of sample size, with a prevalence/proportion (knowledge score of those who have heard about COVID-19 assumed to be 0.5 (Araoye, 2004), a sample size of 384 was rounded up to 400 in order to make up for non-response and attrition. The final sample size of 1200 was used for better representation.

2.5. Sampling methods

Three states out of six were selected by simple random sampling (simple balloting) questionnaires were equally distributed by states. In a state, one urban Local Government Area (LGA) was selected by simple random sampling (simple balloting). In a LGA, one ward and three streets were selected by simple random sampling (simple balloting). Houses were selected on a street by selecting every one in three systematically, and one eligible respondent was randomly selected and interviewed .in a selected house until questionnaire allocated for the street was exhausted and another one randomly selected.

2.6. Research instruments and data collection

The research was carried out with the aid of a semi structured interviewer administered pretested questionnaire that was divided into 4 sections. Standard protective methods were adopted during the period of data collection. Instrument was validated by a review of the instrument by an epidemiologist and virologist.

2.7. Ethical considerations

Ethical approval to conduct this study was obtained from the LAUTECH Teaching Hospital Osogbo research ethics committee. Written informed consent was obtained from all these respondents who had given consent into participating in this study

2.8. Data management

Data collected was cleaned and checked for consistency and validity through random checks and double entry. Univariate analysis includes presentation into tables and charts, while bivariate analysis used the Chi squared test to demonstrate relationship between two categorical variables of interest. Knowledge and perception score was calculated by pulling together all relevant variables and estimating about the mean score. Multivariate analysis depicts predictors of knowledge and risk to COVID-19 among respondents. P-value was kept at 5% of significance for all inferential statistics.

3. Results

Table 1 shows that the mean age of respondents was 36.0 ± 12.1 years, with 366 (30.5%) of respondents being in the 20-29 years age group; 465 (38.8%) were males, 660 (55.0%) had up to tertiary level education, 413 (34.4%) were never married or single. Table 2 shows that 1180 (98.3%) had heard about COVID-19, with the radio 782 (65.2%), Television 725 (60.4%), the internet 575 (47.9%) and through a friend 420 (35.0) being common sources of information. About 1072 (89.3%) said it is a serious disease, 1144 (95.3%) said it is deadly, 1072 (89.3%) said that the disease is preventable while 575 (47.9%) could list 3 countries presently ravaged by COVID-19.

Table 1: Socio-demographic characteristics of respondents (n=1200)

Variable	Frequency	Percentage
Age (years)		
10-19	60	5.0
20-29	366	30.5
30-39	342	28.5
40-49	245	20.4
>50	187	15.6
Sex		
Male	465	38.8
Female	735	61.3
Educational status		
Primary	46	3.8
Secondary	482	40.2
Tertiary	660	55.0
Koranic	6	0.5
No education	2	0.2
Others	4	0.3
Religion		
Islamic	101	8.4
Christianity	1096	91.3
Traditional	3	3
Marital status		
Never married or Single	413	34.4
Divorced	23	1.9
Widowed	46	3.8
Separated	319	26.6
Married	399	33.3

Mean age=36.0+12.1years

Table 2: Respondents knowledge on Coronavirus (n=1200)

Variables	Frequency	Percentage
Ever heard of COVID-19		
Yes	1180	98.3
No	14	1.2
Not sure	6	0.5
*Source of information		
Through a friend	420	35.0
Through radio	782	65.2
Through television	725	60.4
Through health care workers	402	33.5
Through the internet	575	47.9
Through news paper	231	19
Others	170	14.2
Is it a new disease?		
Yes	1072	89.3
No	114	9.5
Don't know	14	1.2
Is it a deadly disease?		
Yes	1144	95.3
No	54	4.5
Don't know	2	2
COVID 19 is preventable		
Yes	1072	89.3
No	92	7.7
Don't know	36	3.0
Could list 3 countries presently ravaged by COVID-19	575	47.9

*multiple response

Table 3 shows that the common way of acquiring the disease known to the respondents include standing beside infected persons 1056 (88.0%) and breathing into same air with an infected person 975 (81.3%). Despite this, some respondents 523 (43.6) and 858 (71.5%) of respondents still hold the myth that COVID-19 could be transmitted through sexual intercourse and mosquito bites respectively. Fever 1141 (95.1%), sneezing or cold 1149 (95.8%) and cough 1188 (99.0%) were the common symptoms of COVID-19 known to our respondents. Majority (not less than 94.0%) knew each of all the various preventive measures against COVID-19. Only 455 (37.9%) think that they can get COVID-19, while 1171 (97.6%) were willing to enlighten someone on COVID-19 prevention, 766 (63.8%) said they could step down going to places of worship if asked to do so, while 738 (61.5%) said they were ready to willingly observe staying indoors or lockdown.

Table 3: Respondents knowledge and perception of risk to COVID-19 (n=1200)

Variables	Frequency	Percentage
*Known means of transmitting Corona virus		
By standing beside infected person	1056	88
By breathing into same air with an infected person	975	81.3
Through bad water	415	34.6
Through skin to skin contact	887	73.9
Through sexual intercourse	523	43.6
Through mosquito bite or contact with some animals	858	71.5
*Known symptoms of Corona virus		
Cough	1188	99
Fever	1141	95.1
Shortness of breath	796	66.3
Chest pains	878	73.2
Sneezing or cold	1149	95.8
Others specify	364	30.3
*Known means of preventing corona virus		
Frequent hand washing	1190	99.2
Putting on a face mask	1166	97.2
Rubbing sanitizer on your hands	1172	97.7
Covering mouth during sneezing and coughing	1179	98.3
Avoiding crowd	1182	98.5
Avoiding someone who just travelled to Nigeria from abroad	1176	98
Talking to others on the need to avoid corona virus	1133	94.4
Calling on a doctor if you have symptom of flu	1161	96.8
Drinking & putting lime, moringa, salt etc inside bathing water	523	43.6
Do you think you can get or catch corona virus		
Yes	455	37.9
No	654	54.5
Don't know	91	7.6
Are you willing to submit yourself to the health authority to be followed up for 14 days if you accidentally come in contact with an infected person.		
Yes	1159	96.6
No	23	1.9
Don't know	18	1.5
Are you willing to enlighten someone on COVID-19 prevention.		
Yes	1171	97.6
No	29	2.5
*Ready to observe the following willingly if directed by Governments		
If they asked you not to go to places of worship	766	63.8
If they direct you not to go to parties/occasions	1008	84.0
If they restrict you and asked you to avoiding crowds	962	80.2
Closing your school or streets	772	64.3
Asking you to stay indoors and not come out (lockdown)	738	61.5

*multiple response

Concerning actions and activities recently being performed by respondents, 1001 (83.4%) said they have been observing regular hand-washing, 725 (60.3%) have been using sanitizers, 806 (67.2%) have been covering their mouth during sneezing and coughing while only 525 (43.8%) have been putting on face mask (Table 4).

Respondents less than 20 years were 1.3 (1/0.77) times less likely to have good knowledge about transmission of COVID-19 compared to those who were above 19 years (OR 0.77, 95% CI 0.5757 - 1.0393), and this observation was found to be statistically significant (p = 0.043). Male respondents were 1.4 times more likely to have good knowledge about transmission of COVID-19 compared to those who were females ((OR 1.38, 95% CI 1.0842 - 1.7489) and this observation was found to be statistically significant (p = 0.004). Respondents with secondary education and below were 1.2 (1/0.84) times less likely to have good knowledge about transmission of COVID-19 compared to those who had tertiary education and above (OR 0.84, 95% CI 0.6654 - 1.0662) though this observation was found not to be statistically significant (p = 0.077). Thus, predictors of good knowledge about transmission of COVID-19 were above 19 years, being a male and having education level above secondary school.

Table 4: Risk assessment of COVID-19 among respondents (n=1200)

Actions	None/never in the last one week	Occasionally (like once)	Sometimes (2-4 times)	Regularly
Frequent hand washing	43(3.6)	92(7.7)	64(5.3)	1001(83.4)
Putting on a face mask	163(13.6)	351(29.3)	161(13.4)	525(43.8)
Rubbing sanitizer on your hands	132(11.0)	209(17.4)	136(11.3)	723(60.3)
Covering mouth during sneezing and coughing	73(6.1)	168(14.0)	153(12.8)	806(67.2)
Avoiding crowd	91(7.6)	220(18.3)	113(9.4)	776(64.7)
Avoiding someone who just travelled to Nigeria from abroad	160(13.3)	264(22.0)	39(3.3)	737(61.4)
Talking to others on the need to avoid corona virus	148(12.3)	256(21.3)	134(11.2)	662(55.2)

Respondents less than 20 years were 2.3 (1/0.43) times less likely to have good knowledge about symptoms of COVID-19 compared to those who were above 19 years (OR 0.43, 95% CI 0.2904 -0.6465), and this observation was found to be statistically significant (p = 0.001). Male respondents were 12 times more likely to have good knowledge about symptoms of COVID-19 compared to those who were females (OR 1.24, 95% CI 0.8429 - 1.8350), but this observation was found not to be statistically significant (p = 0.136). Respondents with secondary education and below were 1.8 (1/0.56) times less likely to have good knowledge of symptoms of COVID-19 compared to those who had tertiary education and above (OR 0.56, 95% CI 0.3834 - 0.8104) though this observation was found not to be statistically significant (p = 0.077). Thus, predictors of good knowledge about symptoms of COVID were respondents being above 19 years, being a male and having education level above secondary school.

Respondents less than 20 years were 1.9 (1/0.54) times less likely to have good knowledge about prevention and control of COVID-19 compared to those who were above 19 years (OR 0.54, 95% CI 0.3134 - 0.9358, and this observation was found to be statistically significant (p = 0.017). Male respondents were 1.3 (1/0.77) times less likely to have good knowledge of prevention and control of COVID-19 compared to those who were females (OR 0.77, 95% CI 0.4669 - 1.2781) though this observation was found not to be statistically significant (p 0.158). Respondents with secondary education and below were 3.3 (1/0.30) times less likely to have good knowledge about prevention and control of COVID-19 compared to those who had tertiary education and above (OR 0.30, 95% CI 0.1760 - 0.5259) and this observation was found to be statistically significant (p = 0.001). Thus, predictors of good knowledge about prevention and control of COVID-19 were respondents being above 19 years, being a female and having education level above secondary school.

Respondents less than 20 years were 1.5 (1/0.67) times less likely to have good perception about the prevention and control measures of COVID-19 compared to those who were above 19 years (OR 0.67, 95% CI 0.4929 - 0.9026), and this observation was found to be statistically significant (p = 0.004). Male respondents were about 1.1 (1/0.87) times likely to have good perception about the prevention and control measures about COVID-19 compared to those who were females (OR 0.87, 95% CI 0.6706 -1.1233) though this observation was found not to be statistically significant (p = 0.141). Respondents with secondary education and below were 1.4 (1/0.74) times less likely to have good perception about the prevention and control measures of COVID-19 compared to those

who had tertiary education and above (OR 0.74, 95% CI 0.5770 - 0.9585) and this observation was found to be statistically significant (p 0.011). Thus, predictors of good perception about the prevention and control measures of COVID-19 were respondents being above 19 years, being a female and having education level above secondary school.

Table 5: Associations and predictors of good knowledge and perception of COVID-19

Variables	Bivariate analysis				Binary logistic regression			
	Good	Poor	X² value	P value	OR	95%CI Lower	Upper	P value
Knowledge score of transmission					**Knowledge score of transmission**			
Age			2.914	0.088	0.77	0.5757	1.0393	0.043**
≤19 years	85(35.7)	153(64.3)						
≥20 years *	390(41.8)	543(58.2)						
Sex			6.897	0.009	1.38	1.0842	1.7489	0.004**
Male	204(45.3)	246(54.7)						
Female *	271(37.6)	450(62.4)						
Education status			2.037	0.154	0.84	0.6654	1.0662	0.077
Secondary and below	197(38.3)	318(61.7)						
Tertiary and above *	278(42.4)	378(57.6)						
Knowledge score of symptoms					**Knowledge score of symptoms**			
Age			17.520	0.001	0.43	0.2904	0.6465	0.001**
≤19 years	197(82.1)	43(17.9)						
≥20 years *	867(91.4)	82(8.6)						
Sex			1.211	0.271	1.24	0.8429	1.8350	0.136
Male	420(90.7)	43(9.3)						
Female *	644(99.7)	82(11.3)						
Education status			9.562	0.002	0.56	0,3834	0.8104	0.001**
Secondary and below	450(86.4)	71(13.6)						
Tertiary and above *	614(91.9)	54(8.1)						
Knowledge score of prevention					**Knowledge score of prevention**			
Age			4.963	0.026	0.54	0.3134	0.9358	0.017**
≤19 years	220(91.7)	20(8.3)						
≥20 years *	914(95.3)	45(4.7)						
Sex			1.014	0.314	0.77	0.4669	1.2781	0.158
Male	435(93.8)	29(6.2)						
Female *	699(95.1)	36(4.9)						
Educational status			20.062	0.001	0.30	0.1760	0.5259	0.001**
Secondary and below	481(91.3)	46(8.7)						
Tertiary and above *	653(97.2)	19(2.8)						
Perception score to prevention					**Perception score to prevention**			
Age			6.938	0.008	0.67	0.4929	0.9026	0.004**
≤19 years	157(65.4)	83(34.6)						
≥20 years *	709(73.9)	250(26.1)						
Sex			1.159	0.282	0.87	0.6706	1.1233	0.141
Male	327(70.5)	137(29.5)						
Female *	539(73.3)	196(26.7)						
Education status			5.249	0.022	0.74	0.5770	0.9585	0.011**
Secondary and below	363(68.9)	164(31.1)						
Tertiary and above *	503(74.9)	169(25.1)						

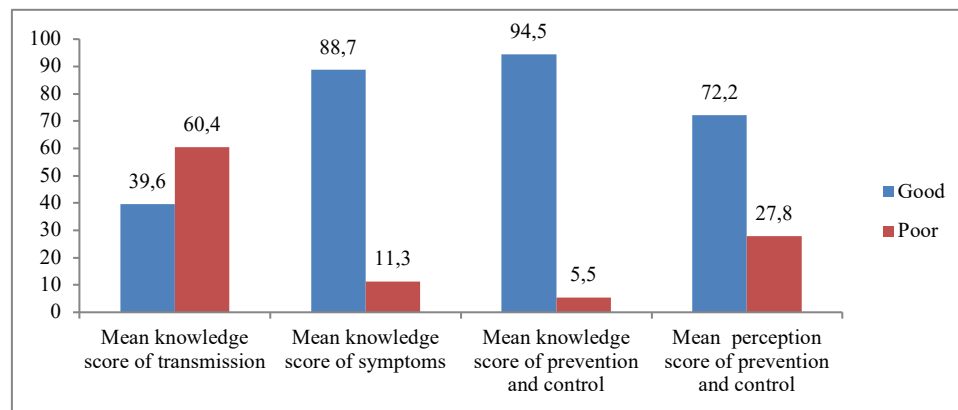*Reference category   **Significant p value

Figure 1: Mean knowledge and perception scores of COVID-19

4. Discussions

Nigeria is still at the centre of the COVID-19 pandemic, with increasing number of cases being detected daily. While the government and other stakeholders are investing a lot of resources in educating the public about the disease and the need for them to adopt preventive practices, little or nothing exists in the literature about the risk communication, knowledge and community attitude to the disease. Understanding these, will help to know the gaps in knowledge, negative attitude and possible misconceptions, which could then be factored in designing appropriate messages and methods; hence this study.

The level of awareness about COVID-19 was very high among the respondents, and almost all of them had heard about COVID-19 before. This supports another study on COVID-19. (Geldsetzer, 2020) This should not be surprising with the publicity that has been given to the disease on both the conventional and news media, and rightfully so. In fact, the concern should be why 2% of the population has never heard about the disease with all that has happened. The major sources of information have been the radio, television and internet. While the important role of the radio and television in disseminating health information has been well noted and published, the emerging important role of the internet must be acknowledged and properly harnessed for health promotion and education, especially as it relates to COVID-19. This is particularly so, because it can be a tool for spreading misconceptions, myths and falsehoods because it is largely unregulated. (Geldsetzer, 2020) (Bhagavathula et. al., 2020)

The high level of awareness among respondents did not however translate to high comprehensive knowledge about the transmission of COVID-19. A very important part of the epidemiology of a disease that should be understood is the transmission, because it will inform measures that will be put in place to prevent its spread. It was however a thing of concern that only about two-fifths of the respondents had good comprehensive knowledge about this. This is similar to what was reported by Bhagavathula and others Bhagavathula et. al., (2020) in United Arab Emirates, but different from what was reported among residents of the United States (US), United Kingdom (UK) Geldsetzer, (2020) and China, Zhong et. al. (2020) where they reported very high comprehensive knowledge among their respondents. This difference may however be due to the different methodologies used, both of these studies were online surveys, with a tendency to attract those of relatively higher socio-economic status.

The widespread myths about the transmission of COVID-19 was also of concern in the present study, with a little more than 7 out of 10 of the respondents believing that it could be transmitted by mosquito bite, more than two-fifths believed it could be sexually transmitted and a third of them believed it could be spread by bad water. Misconceptions were also reported by Geldsetzer. (Geldsetzer, 2020) For improved effectiveness of the health education interventions for COVID-19, there will be a need to deliberately address these misconceptions.

It was encouraging that majority of the people had good comprehensive knowledge about the symptoms, prevention and control of COVID-19, however there were some gaps in the knowledge that should be of concern to the stakeholders. More than two-fifths still thought they could prevent COVID-19 by drinking and putting lime, moringa, and salt. inside bathing water. This misconception for example, has the potential to give a sense of false

security to people and hence they may not take the conventional preventive measures seriously. Furthermore, it also seems that the commonly known symptoms of COVID-19 are cough, fever and sneezing/cold. A third of the respondents and more than a quarter did not know about shortness of breath and chest pains respectively. Although other previous studies have generally reported good knowledge, there have been reports of misconceptions and knowledge gaps too. (Geldsetzer, 2020; Bhagavathula. et. al., 2020) Similar trend of misconceptions was observed during the early days of SARS pandemic. (Jiao et. al., 2005) This finding further underscores the need to continually review the content and methods of the health education programmes.

The overall perception of the respondents towards the prevention and control of COVID-19 was good with 7 out of 10 respondents having a favourable/positive attitude towards it. This is similar to what has been reported by previous studies. Geldsetzer, (2020). (Zhong et. al., 2020) This notwithstanding, there are gaps also that must be addressed by any planned health education interventions. A major one is their perceived vulnerability to the disease, with less than two-fifths agreeing that they are at risk of COVID-19. This is important because perceived vulnerability would affect how preventive measures are embraced. Another area of concern is that nearly 40% of the respondents were not willing to stay indoors, close schools or streets and not go to places of worship even if directed by the government. These may be due to the poor comprehensive knowledge by many of the respondents about the transmission of COVID-19, as knowledge has been found to predict attitude towards COVID-19. (Zhong et. al., 2020)

The risk assessment showed that only the frequent hand washing has been embraced by majority of the respondents, other evidence-based preventive practices have not been widely adopted by the respondents. Only three-fifths of the respondents rubbed sanitizer regularly, avoided crowded areas and avoided recent travelers, especially to high risk locations regularly. More disturbingly, only two-fifths of the respondents wore masks regularly even in crowded areas. This finding is different from that in China where more than 9 out of 10 wore masks regularly when going out, and most of them avoided crowded places. (Zhong et. al., 2020) More, therefore needs to be done in educating Nigerians.

Those respondents who were younger than 20 years (adolescents) consistently had significantly poorer knowledge (about transmission, symptoms, prevention and control) and perception towards COVID-19. Similarly, the younger age group in China was also found to have significantly poorer knowledge about COVID-19. (Zhong et. al., 2020) This age group should therefore be targeted for educational intervention programmes for COVID-19. Understandably also, those with lower educational status were significantly associated with poorer knowledge and perception towards COVID-19. Stakeholders will therefore need to target this group by using appropriate media, language and presentation methods for them, to ensure no one is left behind in the fight against COVID-19. Gender was also consistently associated with the respondents' knowledge and perception in the present study, but while males were more likely to have good knowledge about transmission, symptoms, prevention and control, females were more likely to have favourable attitudes. This corroborates the finding in China where females were significantly more likely to have favourable attitude compared to males. This may be in support of the anecdotal evidence that suggests that males are more daring, while females are more believing and comply more easily than males. This should also be factored into the design of educational programmes for COVID-19 in Nigeria.

The strength of this study is that it is one of the earliest, if not the earliest study on the subject, and also because it is a community-based study using a random sample of adults at household level. This makes it more representative than the online surveys that are presently prevalent on the subject. The limitation of this study is that it was carried out in the southwestern part of Nigeria, and the findings may not be generalizable to the whole Nigeria.

Conclusion

Poor knowledge of COVID-10 transmission, but good knowledge of prevention and good perception was reported among communities in Southwestern Nigeria. Only few believed they could get the disease which unfortunately have not impressed their knowledge of prevention measures, and attitude to containment measures such as compliance with lockdown and stay at home order by Governments. This calls for mass enlightenment campaign and good communication messages directed at the general population which can encourage behavioural change that would assist to halt the transmission of COVID-19 and prevention of community spread..

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Review of COVID-19 in Children Admitted to King Fahad Hospital, Albaha, Saudi Arabia in 2020

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Abstract
Background: The coronavirus disease (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified at the end of 2019 in Wuhan City, China and then spread worldwide. Objectives: The study aimed to evaluate COVID-19 symptoms, signs, management, and outcomes in admitted children. Methods: This retrospective cohort study was conducted at King Fahad Hospital, Albaha, Saudi Arabia, which is designated as the center for COVID-19 patients. Data were collected retrospectively between Apr 2020 and Mar 2021. The protocols of health authorities in Saudi Arabia were used for the diagnosis and management of all patients. Results: Positive test results were confirmed in 95 patients. Of these, 44 (46%) were males and 51 (54%) were females. Fever, cough, nasal congestion, sore throat, myalgia, and upper respiratory tract infections were the most common symptoms. The common comorbidities in this cohort were respiratory diseases (19%), type1 diabetes mellitus (16%), followed by obesity (11%), chronic kidney disease (4%), congenital heart diseases (2%), while in (48%) pts no comorbidity factors were reported. Fever was the most frequent symptom, reported in 95% of patients. Multisystem inflammatory syndrome (MIS-C) has been reported in one patient. Guillain-Barre syndrome was reported in one female patient and Kawasaki symptoms in one male patient. No mortality was reported. Conclusion: Most children with COVID-19 presented with mild clinical manifestations and good outcomes. No mortality was reported in this study. Obesity is a serious comorbidity and risk factor for severe diseases.

Keywords: COVID-19, SARS-CoV-2

Abbreviations: URT; upper respiratory tract. GIT; gastrointestinal tract. PICU; pediatric intensive care unit. KFH; King Fahad Hospital. BMI; body mass index. IVIG; Intravenous immunoglobulin. CKD; chronic kidney disease. SD; standard deviation. P value; probability of chance. COVID; coronavirus disease.

Introduction

The coronavirus disease (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [Li Q et al, 2020, Castagnoli R, et al 2020]. It was started and identified at the end of 2019 in Wuhan city, China, and then spread all over the world [Bi Q et al 2020]. World Health Organization (WHO) declared COVID-19 as a pandemic disease in March 2020 [WHO media briefing on COVID-19, 2020, WHO Living guidance，2021]. Prevalence of disease differs among countries [AAP, Post-COVID-19 conditions 2019]. American Academy of Pediatrics provides that children have same risk of infection as the adult but present with mild clinical manifestations [Shekerdemian LS et al, 2019, Zimmermann P et al 2020]. Upper respiratory tract infection, fever, cough, and rhinorrhea are the common presentation signs, while nausea, vomiting, and diarrhea are reported as first symptoms in some cases. Loss of the sense of taste and loss of smell can be seen in children, and its incidence increases with increasing age in children [Dong Y et al, 2019, Timothy G et al 2021]. No significant differences have been reported between male and female children [Timothy G al 2021, De Lusignan S et al 2020]. Children can have COVID-19 through close contact with positive family members and with other students in the school [Sophia T, Ekaterini S 2021, Zhang JJY et al 2020, Li F et al, 2021, Brandon MH et al 2020]. Some laboratory changes reported in some cases include: Lymphocytosis, lymphopenia, neutropenia, high liver and muscle enzymes, increased lactate dehydrogenase, elevated C-reactive protein (CRP) level, elevated erythrocyte sedimentation rate, and elevated D-dimer [Chen W et al 2020, Mehra MR et al 2020]. Supportive care and oxygen supply were the main therapies in children with hypoxia. Remdesivir was the first antiviral gent, approved by FDA for treatment of COVID-19 used in the treatment of hospitalized patients. Remdesivir and hydroxychloroquine, both with and without azithromycin, tocilizumab, and convalescent plasma, were used as therapeutic options in children with severe disease course in a North American study [Mehra M et al 2020, Shen KL et al, 2020]. Corticosteroids and IVIG improve survival in severe cases. Saudi Arabia was among the first countries to implement early and unprecedented precautionary measures to prevent COVID-19 before reporting the first case in the country on March 2nd, 2020 (Algaissi AA et all, WMA Declaration of Helsinki 2013).

Objective

This study aimed to evaluate COVID-19 symptoms, signs, diagnostic tests, management, and outcome in admitted children.

Methodology

This retrospective cohort study was conducted at King Fahad Hospital, Albaha, Saudi Arabia, which is designated as the center for accepting and managing the patients who had positive COVID-19. Data were retrospectively collected between April 2020 and March 2021. The protocols of the health authorities in Saudi Arabia were applied for diagnosis, admission, and management [Algaissi AA et all, WMA Declaration of Helsinki 2013]. A nasopharyngeal swab PCR was performed to confirm the disease (table1). The patient was admitted to the hospital if his score was ≥ 4, isolated, and started on management until his swab result ready. Management was initiated for all admitted patients and modified according to swab results. Positive patients were admitted to isolated COVID words for 14 days and managed by a corona team. Three negative swab results obtained 24 hours apart were requested before discharge. All included children were aged 1–14 years and had a positive corona test. Presence of fever, cough, and shortness of breath, sore throat, rhinorrhea, headache, diarrhea, and vomiting were the important signs checked. Contact with confirmed cases or a history of travel abroad in the last 14 days prior to symptom onset were considered exposure risks for acute respiratory illnesses. Chronic obstructive lung disease, chronic renal failure, coronary artery disease, heart failure, immunocompromised patients, bronchial asthma, diabetes, and obesity were considered comorbidity risk factors. Mild cases received supportive and symptomatic treatment, while corticosteroids, prophylactic dose of

enoxaparin, and antiviral medications were started for ten days when patient developed hypoxia and pneumonia. Statistical significance was calculated by SPSS version 23.0. P-value was considered significant if equal or less than 0.05. The study was approved by the scientific research committee and King Fahad Hospital Albaha Institutional Review Board. Patient privacy was ensured. The principles of the Helsinki Declaration were respected in this cohort [WMA Declaration of Helsinki 2013]. The authors declared that they had no funding and no conflicts of interest.

Table1: Saudi Ministry of health protocol for COVI-19, march 2020.

Risks of acute respiratory illnesses	score	score
1. Exposure risks:	pediatric	adult
• History of travel abroad	3	3
• Contact with confirmed case COVID-19	3	3
• Working in health care facility	3	3
• Exposure to camel's product	3	3
2. clinical symptoms and signs:	score	score
• Fever.	4	4
• Cough.	4	4
• Shortness of breath	4	4
• Headache, sore throat, or rhinorrhea.	1	1
• Nausea, vomiting, or diarrhea.	1	1
• Chronic renal failure.	.	1
• CAD.	.	1
• Heart failure.	.	1
• Immunocompromised.	.	1
Admission if score 4 and more, do nasopharyngeal swab. Isolation 14 days for positive test. Discharge after three negative tests with 24 hours apart.		

Results

Due to strict measures in Saudi Arabia applied on Mar 2020 to limit spread of disease, total of 350 children were admitted with score $\geq$ 4 and symptoms and signs of suspected COVID-19. The mean age was 7 years (SD 2.57), P = 0.006; positive test confirmed in 95 patients (27%), 44 (46%) were male, and 51(54%) were female. Fever was the most frequent symptom, reported in 95% of patients. Other symptoms frequently reported were cough (58%), rhinorrhea or nasal congestion (67%), myalgias (17%), fatigue (12%), sore throat (32%), and dyspnea (26%). The median duration of cough was 5-7 days. Headache was the common neurological symptom reported in 35% of patients. Diarrhea was observed in 37% of the patients. The presenting vital signs showed a median heart rate of 92 bpm and median temperature of 38.5 °C. The duration of admission was 14 days. Patients were admitted to the pediatric corona ward. Six patients 6% were admitted to the pediatric intensive care unit (PICU). The most common comorbidities in this cohort were respiratory diseases reported in 18 (19%) p=0.16, Type1 diabetes mellitus was reported in 15 (16%) patients p=0.18. Obesity was reported in 10 (11%) patients with high BMI (95% CI [1.3-2.1], (P = 0.21). Chronic kidney disease (CKD) in 4 (4%) patients (P = 0.24). Congenital heart diseases reported in 2 (2%) patients p= 0.33. No comorbidities reported in others 46 (48%) patients (table2). Multisystem inflammatory syndrome in children (MIS-C) was diagnosed in one male patient, who had severe pneumonia associated with liver and kidney impairment. This patient was critically ill and was managed in the PICU. Severe bilateral pneumonia was diagnosed in one obese patient with BMI was (>35). Guillain Barre` Syndrome developed in 4 year old girl. The condition started with cough and fever, and contact to parents positive COVID, in the second day after URTI symptoms, she developed inability to walk and ascending paralysis, COVID test came positive and the patient was diagnosed as GBS, axonal type by nerve conduction velocity, with quadriparesis. Power in the lower limbs was 2–3 and power in the upper limbs was 3–4, with absent reflexes in all limbs, given three courses of IVIG, followed by nine months of oral prednisolone, and extensive physiotherapy with a very good response and minimal residual weakness in the proximal muscles of the lower limbs. Two patients had high levels of pancreatic enzymes. No gastrointestinal bleeding was reported.

Kawasaki-like disease was confirmed in one patient with persistent fever, skin rash, conjunctivitis, and coronary artery ectasia confirmed by echocardiography. Diarrhea**,** vomiting, and abdominal pain without respiratory symptoms were observed in 9 (9%) patients. The overall mortality calculated zero in this cohort. Elevated leukocyte levels (35%), erythrocyte sedimentation rates (25%), and C - reactive protein levels (21%), lactate dehydrogenase levels (19%), neutropenia (2%), lymphopenia (8%), and lymphocytosis (30%) were observed. Kidney dysfunction has been reported in two severely ill children. The highest number of positive patients reported in May, Jun, and Jul 2020, (table3).

Table 2: Common symptoms, signs, and comorbidity in positive test pts

Findings	95 pts	Percent	Male	Female	P value
Fever	90	95%	42	48	0.04
Cough	55	58%	27	28	0.06
Dyspnea	25	26%	11	14	0.15
Rhinorrhea	64	67%	31	33	0.05
Sore throat	30	32%	16	14	0.12
Headache	33	35%	15	18	0.13
Vomiting	15	16%	8	7	0.18
Diarrhea	35	37%	18	17	0.07
No smell	5	5%	2	3	0.22
No taste	3	3%	1	2	0.31
Respiratory	18	19%	10	8	0.16
Type1 DM	15	16%	9	6	0.18
Obese	10	11%	6	4	0.21
CKD	4	4%	1	3	0.24
CHD	2	2%	1	1	0.33

Table 3: Distribution of positive cases per month

Months	suspected	positive	%
Apr 20	30	6	20%
May20	60	24	40%
Jun20	64	26	41%
Jul20	40	11	28%
Aug20	30	8	27%
Sep20	30	5	17%
Oct20	30	4	13%
Nov20	13	1	8%
Dec20	12	3	25%
Jan21	16	4	25%
Feb21	15	2	13%
Mar21	10	1	10%

Discussion

The health authorities in Saudi Arabia immediately applied clear protocols for COVID-19 and implemented strict measures to limit and manage the spread of disease on March 2020 and modified it upon the situation of the disease. Consistent with other published studies, this cohort revealed that history of previous respiratory diseases, diabetes mellitus type1, and obesity were the most common comorbidities associated with severe cases on positive COVI-19 reported in admitted children, and obesity reported more common in male children [Zhang JJY et al 2020, Li F et al, 2021, Brandon MH et al 2020]. Fever, cough, dyspnea, rhinorrhea, chills, upper respiratory tract infection, myalgia, fatigue, and sore throat were the most common symptoms on presentation [Dong Y et al, 2019, Timothy G al 2021]. Gastrointestinal symptoms, myalgia, were reported less common. These results are consistent with WHO findings and other international studies [Li Q et al, 2020, Castagnoli R,

et al 2020, Bi Q et al 2020]. Our cohort reported a zero mortality rate, compared with worldwide COVID-19 mortality was 6.9%, US mortality 3.8%, Spain 10.2%, Italy 12.8% and China 4.0% [7-8-10]. This is the first study in Albaha area focused on the epidemiology, clinical presentation, and management strategies of children with COVID-19. Among the children evaluated for suspected COVID-19, 28% were confirmed to have COVID-19. 98.6% had a history of exposure to infected family members. We observed that most children were asymptomatic or had a mild disease course, and there was no significant difference between affected girls and boys with COVID-19, as reported in other studies (Shekerdemian LS et al, 2019, Zimmermann P, Curtis N 2020, Dong Y et al, 2019). Regarding our protocol, the hospital admission for positive patients was 14 days (Algaissi AA et all, 202, WMA Declaration of Helsinki 2013). In our cohort, 75% of the patients had mild symptoms. The detection of asymptomatic children was important to decrease the transmission process [Bi Q et al 2020, Sophia T, Ekaterini S 2021]. International studies have confirmed that severe illness is far less frequent in children than in adults (Bi Q et al 2020, WHO media briefing on COVID-19, 2020). Only six patients (6%) were admitted to the PICU. Radiological imaging was not routinely performed in children with suspected or confirmed COVID-19 (Chen W et al, 2020, Mehra MR et al 2020). Leukopenia was considered a predictor of a severe disease course in children because it was detected in critically ill children, while normal laboratory workup was reported in asymptomatic and mild cases (Timothy G al 2021, Li F et al, 2021, Brandon MH et all 2020). MIS-c was reported in one critical patient in our study. Favipiravir, intravenous immunoglobulin (IVIG), hydroxychloroquine, and corticosteroid were used as therapeutic options in children with severe disease courses consisting of international studies. We believe that supportive care in pediatric cases remains the main therapeutic option, as reported in the literature (De Lusignan S et al 2020, Mehra M et al 2020, Shen KL et al, 2020].

Limitations

The short follow-up period and retrospective review of affected children were considered limitations of this cohort. More research needs to be done on optimizing the treatment and outcome of COVID-19 in children.

Conclusion

This cohort study reported that the clinical presentation was mild with good outcomes in children admitted with positive COVID-19. Highly negative swab test results have been reported for suspected cases. The overall mortality rate of the admitted children was zero. The study revealed that age, sex, did not affect the occurrence of hospital course of the patients. Obesity is a major comorbidity in critically ill patients. More research is needed to optimize the treatment and outcome of COVID-19, especially after the widespread application of the corona vaccine in Saudi Arabia.

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Implementation of Universal Precautions for Health Workers in the City Health Services in Indonesia

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Abstract

Background: The most health problem in Indonesia for health services is infectious diseases. So the need to implement Universal Precautions is one of the efforts to prevent infection in health facilities. Aim : This study aims to implementation of universal precautions for health workers in the city health services. This study uses a quantitative design that is observational, with a cross-sectional study design. Methods: The sample in this study was the total number of health personnel in health services as many as 108 people consisting of a hospital as many as 89 nurses, a public health center with 9 nurses, and a clinic as many as 10 nurses. The instrument used in the application of universal precautions is through observation, using a monitoring sheet. Results: The result proportion of the not application of universal precautions at the level of hospital health services is 83.3%. The results showed that the higher the level of health care, the higher the average application of universal precautions. The application of universal precautions at the health service level has the same level of service in handling patients, and there are still nurses who do not use APD aprons. Conclusion: The health service conducts training and the head of the room directs the nurse about universal vigilance when the shift changes, so that the nurse can apply universal precautions according to the standard operating procedures (SOP).

Keywords: Universal Precautions, Knowledge, Attitude, Leadership Support, Hand Washing

1. Introduction

Health workers that are exposed to blood and other bodily fluids will have a higher risk of being infected with blood-borne viruses such as HIV / AIDS, Hepatitis B (HBV) and hepatitis C (HCV). The probability of risk is greatly influenced by the prevalence of disease in the patient and the frequency of exposure. Frequent exposures such as needle prick or other sharp object injuries, splashes around blood or other body fluids into the eye, nose or mouth, blood in contact with a cut skin. One of the strategies to protect health workers is the implementation of universal precautions.

Universal precautions are part of infection control efforts in healthcare services. Other efforts that are components of infection control in service areas are surveillance, measurement of outbreaks, development of policies and work procedures as well as continuous education and training in infection prevention, which cannot be separated.

Standard universal precautions apply to all types of care for all patients, irrespective of the patient's disease state. These precautions must follow applicable SOPs when there is a risk of potential exposure to 1) blood; 2) all body fluids, secretions and excretions except sweat (regardless of whether they contain blood); 3) skin and 4) mucous membranes. Universal precautions also include hand hygiene measures and personal protective equipment (PPE) (Ndu and Arinze-Onyia, 2017; Banach *et al.*, 2018; Committee on infectious diseases, 2018). Exposure to blood-borne pathogens can adversely affect health care workers, especially in resource-poor countries (Prüss-Üstün, Rapiti and Hutin, 2005; Motamed N, BabaMahmoodi F, Khalilian A, Peykanheirati M, 2006).

Health problems in Indonesia that are high in health services are infectious diseases. Based on the WHO healthcare associated infection in the world in several reporting countries. Shows varying numbers on the incidence of HCAI from 5.7% to 19.1%. The reported HCAI incidence rates were Albani 19.1%, Mali 18.4%, Tunisia 17.9%, Serbia 17.4%, Brazil 14%, Ghana 6.7%, Thailand 6.5%, Mongolia 5, 4%, Malaysia 14%, and Indonesia 7.1% (WHO, 2011).

In Indonesia, there is an infection prevention and control unit (PPI) which has the objective of identifying and reducing the risk of infection that is acquired and transmitted among patients, staff of health professionals, contract workers, volunteers, and visitors. Awareness of the application of universal precautions has not been fully implemented. Based on target observations in implementing universal precautions in handwashing, use of PPE, disposal of medical and non-media waste, linen management has not all reached the predetermined target of 100%.

2. Method

The research design used in this study observational, with a cross-sectional study design. The research begins with the preparation of a research proposal and a discussion about the head researcher and the members to agree on the research topic, the research method to be used, and the timing of the research. Furthermore, the data collection stage.

2.1 Sample Collections

The data used in this study are primary data, namely by conducting interviews for a questionnaire that will measure the implementation of universal precautions in health services to be implemented. This data will also be complemented by the results of field observations. The next step was checking the data to ensure that the data obtained were complete, filled in and consistent. The last stage in this research is dissemination. In this study, the data collection technique that the writer used was a saturated sample (total sampling) where the respondents of this study were all health workers in health services (hospitals, public health centers and clinics). The total number of health personnel of health services is 108 people, consisting of a hospital with as many as 89 nurses, a public health center with 9 nurses and a clinic as many as 10 nurses.

2.2 Assessments

This questionnaire has been tested for validity and reliability. The instrument used in the application of universal precautions is by means of observation, using a monitoring sheet. Observation techniques by observing respondents in handwashing activities, the appropriateness of using PPE, waste management, and linen management. This observation is assisted by the chairman of each ward in 1 monitoring. How to score on handwashing monitoring, compliance with the accuracy of PPE, waste management and linen management, namely if the respondent's answer is No then it is given a value of = 0, and if the respondent's answer is yes then it is given a value = 1. Instrument used on knowledge with the questionnaire method. How to questionnaire by filling the multiple choice as many as 10 questions related to vigilance universal. Give one of the correct answers by giving across, if the respondent's answer is wrong then it is given a value of = 0, and if the respondent's answer is wrong then it is given a value of = 1. This instrument is used in attitude to the questionnaire method, the questions total 17 questions. Respondents can provide responses by means of a checklist in the column provided. Attitude

variables use scale Liker, tenure open questions to determine the vulnerability of the first respondent's work. The instrument used is a questionnaire filled with 5 questions. Respondents can provide a checklist in the column provided.

2.3 Statistical Analyses

This analysis is used to see the differences between groups of variables. The statistical test used is the independent t-test. Analysis of differences in application of universal precautions between groups using the T-Independent Test was used to test the mean between different groups. In the T-Independent test, there is a Levene's Test for Equality of Variance, which is to find out the variance equation between the two groups and Levene's Test for Equality of Means, which is to find out the average difference between the two groups. If the value of the Levene's Test for Equality of Variance> 0.05 then the variance between the two groups is the same and the data read is equal variance assumed and vice versa if the Levene's Test for Equality of Variance is ≤ 0.05 then the variance between the two groups is not the same and the data read is equal variance not assumed.

The result of p-value ≤ 0.05 means that there is a significant difference between the control group and the experimental group and vice versa, if the p-value> 0.05 then there is no significant difference between the control group and the experimental group. If the data is normally distributed, it is used in parametric statistical analysis in the form of an independent t-test to see if there is a significant difference in the application of Universal Precautions. If the data is not normally distributed, a non-parametric statistical analysis is used in the form of Mann-Whitney.

3. Results

Implementation of universal precautions was carried out at three levels of health services, namely hospitals, health centers and clinics for 108 nurses. This research also examines the variables of knowledge, attitudes and leadership support.

Table 1: Frequency distribution of the Implementation of universal precautions

Variable	Health Service Facilities			
	Hospital	Public Health Center	Clinics	Total
Application of universal precautions				
Not applying	60 (83.3)	5 (6.9)	7 (9.7)	72 (100)
Applying	29 (80.6)	4 (11.1)	3 (8.3)	36 (100)
Knowledge				
Deficient	50 (52.7)	6 (9.4)	8 (12.5)	64 (100)
Good	39 (36.3)	3 (3.7)	2 (4.1)	44 (100)
Attitude				
Negative	68 (81)	7 (8.3)	9 (10.7)	84 (100)
Positive	21 (87.5)	2 (8.3)	1 (4.2)	24 (100)
Support from leadership				
Less supportive	44 (80)	4 (7.3)	7 (12.7)	55 (100)
Support	45 (84.9)	5 (9.4)	3 (5.7)	53 (100)

Table 1 shows the highest proportion of the not application of universal precautions at the level of hospital health services is 60 (83.3%), at the health center the highest proportion of those who did not apply was 5 (6.9%), while at the level of clinical health services the highest proportion was not apply by 7 (9.7%). The highest proportion of knowledge at the level of hospital health services with less knowledge was 50 (52.7%), while at public health centers as the highest proportion of knowledge was less than 6 (9.4%), while at the clinical health service level the highest proportion of knowledge was less than 8 (12.5%). Attitudes have the highest proportion to the level of hospital health services, namely negative attitudes to 68 (81%), while at Public Health Center the highest

proportion of negative attitudes is 7 (8.3%), while at the level of clinical health services the highest proportion is negative attitudes of 9 (10.7%). Leadership supported with the highest proportion of the level of hospital health services was 45 (84.9%), while at public health center the highest proportion was 5 (9.4%), while at the clinical health service level the highest proportion was less supportive at 7 (12.7%).

Table 2: Distribution of respondents according to attitude in the implementation of universal precautions in health services

	Attitude	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	Risk of contracting hepatitis B after one needle stick	42 (35)	69 (59)	7 (6)	
2.	Giving nursing to infected patients	22 (18.8)	84 (71.8)	12 (9.4)	
3.	Put intravenous and inject using gloves	23 (19.7)	76 (64.1)	19 (16.2)	
4.	Lines when processing the contamination equipment you must wear your hands	23 (19.7)	76 (64.1)	19 (16.2)	
5.	Closing needles using one-handed technique	22 (18.8)	77 (65)	19 (16.2)	
6.	Sharps should be placed in a transparent container	64 (54.7)	46 (38.5)	8 (6.8)	
7.	Exposed, disposed of in infectious waste	13 (10.3)	85 (72.6)	20 (17.1)	
8.	Gauze Handscoon and disposable bath masks are disposed of in medical waste	13 (10.3)	87 (74.4)	18 (15.4)	
9.	If exposed to blood and body fluids, help first disinfectant	13 (11.1)	81 (68.4)	24 (20.5)	
10.	Report of exposure to special services	7 (5.1)	87 (74.4)	24 (20.5)	
11.	Nurses do not allow contact with HIV / positive patients	9 (7.7)	11 (9.5)	97 (82.9)	1 (9)
12.	not assume that all patients have the potential for infectious disease	8 (6.8)	7 (6)	102 (86.3)	1 (9)
13.	Need to be careful when treating wounds that bleed	50 (42.7)	43 (35.9)	25 (21.4)	
14.	Nurses see that the safety box is full, immediately closes and replaces new	50 (42.7)	43 (35.9)	25 (21.4)	
15.	In an emergency condition that requires DPR action, PPE is not important	3 (1.7)	5 (4.3)	98 (83.8)	23 (10.3)
16.	Conducting nursing in infected patients to non-infected patients even though the gloves are not exposed to blood	3 (2.8)	45 (38.5)	66 (56.4)	3 (2.6)
17.	Although treating infected patients will not contract when working according to SOP	30 (25.6)	88 (74.4)		

Table 2 shows the highest proportion of strongly agree is the attitude of nurses for sharp waste such as syringes that must be placed in a transparent container as many as 64 (54.7). The proportion the highest level of agreement is hands coons and used masks disposed of in medical waste, after receiving help such as I above, report the exposure to the special service / occupational medicine, and the attitude of the nurse who, although caring for infected patients, I am sure they will not be infected if I work according to the SOP as many as 87 (74.4%), the highest proportion for the attitude of nurses who disagree is attitude 101 (86.3%), the highest proportion of nurses who strongly disagreed was the attitude of nurses who should not assume that all patients had the potential for infectious diseases as much as 23 (10.3%).

Table 3: Distribution of respondents according to support for implementation universal precautions in health services

No	Support	Never		Sometimes		Often		Always	
		n	%	n	%	n	%	n	%
1.	Hospital directors work together to ensure safe working conditions			54	45.3	14	12	50	42.7
2.	PPI is active in the socialization of standard precautions			12	9.4	30	25.6	76	65.0
3.	The head of the room does safety, talking about universal precautions	3	2.6	7	6	92	78.6	16	12.8
4.	PPI is active in monitoring universal vigilance			5	12	72	61.5	31	26.5
5.	Reward is held by the PPI team, to nurses who obey universal precautions	76	65	14	13	22	18.8	5	4.3

Table 3 shows the proportion of support from leaders who never give reward by the PPI team, to nurses who obey in implementation precautions universal as much as 76 (65%), the proportion of leadership support who sometimes is directors working together to ensure safe working conditions is 53 (45.3%), the proportion of leadership support that is often is the head of ru Do not do safety talking about precautions universal before the morning application as many as 92 (78.6%), the proportion of leaders who are always PPI active in socializing standard precautions is 92 (78.6%).
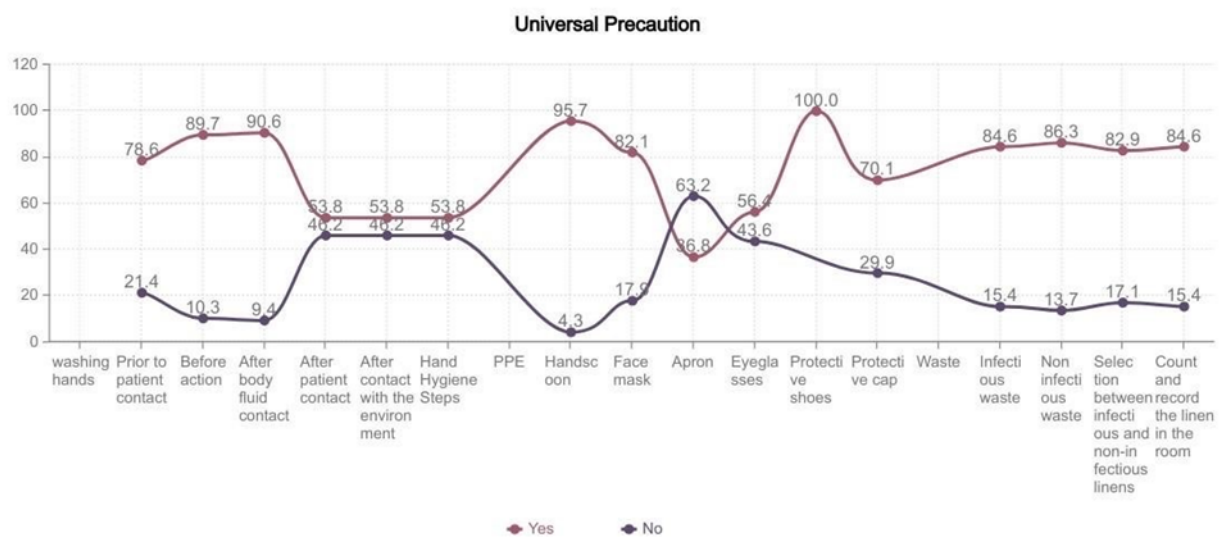

Figure 1: Distribution of respondents in the implementation of universal precautions in health services

Figure 1 shows the highest proportion of nurses who washed their hands was after contact with the patient's body fluids as much as 106 (90.6%) and the highest proportion of nurses who did not wash their hands was at the time. After contact with the environment and hand hygiene steps as much as 61 (52.1%). Based on, the highest proportion of nurses who wore PPE were protective shoes as much as 117 (100%) and the lowest proportion of nurses who wore PPE was aprons as much as 43 (36.8%). According to the observation of waste and linen, the highest proportion of nurses who carried out non-infectious waste was 101 (86.3%) and the highest proportion of processing linen in counting and recording linen in the nurse's room using PPE was apron as much as 99 (84.6%).

Table 4: Differences in the Implementation of universal precautions at the level of health care

Facilities Health	n	Mean	SD	Value F (Anova)	p
Hospital	89	7.13	1.524	1.338	0.826
Public Health Center	9	6.67	1.658		
Clinics	10	6.40	1.265		

Table 4 shows the average the implementation of universal precautions in hospitals is 7.13, health centers are 6.67 and clinics with an average of 6.40. The results show that the higher the level of health services, the higher the average application of universal precautions. The application of universal precautions at the level of health care has the same level of care in treating patients.

4. Discussion

The highest proportion of knowledge at the level of hospital health services with less knowledge was 50 (52.7%), while at the public health center the highest proportion of knowledge was less than 6 (9.4%), whereas at the level of clinical health services The highest proportion of knowledge was less than 8 (12.5%). The level of knowledge of health workers in this study is similar to findings reported in previously published studies in both Afghanistan and neighboring Iran (Motamed N, BabaMahmoodi F, Khalilian A, Peykanheirati M, 2006; Salehi and Garner, 2010). Based on the results of research, good knowledge has been carried out, namely nurses who know the definition of universal precautions as many as 87 (74.4%), nurses who know the purpose of universal precautions as many as 71 (60.4%), nurses who know the main principles of precautions universal as many as 96 (82.1%), nurses who know the factors that can affect universal alertness are 66 (56.4%), nurses who know when Universal precautions are implemented are 89 (76.1%), nurses who know how to provide good health care. Contact with the patient's blood/body fluids, when to wash hands as much as 94 (80.3%), Nurses who know what personal protective equipment (PPE) to use when injecting, inserting infusions, processing contaminated equipment as many as 91 (77.8%), Nurses who know how to close the syringe with one-handed technique (Recapping) are 100 (85.5%), Nurses know how to handle the needle 100 m infusions that have been contaminated safely (96.6%), while the nurses know how to use universal precautions, namely, nurses who do not know the impact if they do not apply Universal precautions as many as 97 (82.9%).

Staff should have good knowledge about infection prevention, behave and act appropriately in taking every action. This is very important because every individual who works in a hospital or other health service center is a group of people who are very vulnerable to contracting or transmitting infection (Spiritia, 2008; Wilson E. Sadoh, Adeniran O. Fawole, Ayebo E. Sadoh, Ayo O. Oladimeji, 2006). Low awareness and understanding of preventive measures among health workers are associated with the absence of information during training and orientation programs, in addition to lack of knowledge due to not providing training to health workers on safe behavior inpatient care and adherence and knowledge of the practices provided is still lacking (Wilson E. Sadoh, Adeniran O. Fawole, Ayebo E. Sadoh, Ayo O. Oladimeji, 2006).

Attitudes have the highest proportion at the level of hospital health services, namely negative attitudes of 68 (81%), while at Public Health Center the highest proportion of negative attitudes is 7 (8.3%), while at the level of clinical health services the highest proportion is negative attitudes of 9 (10.7%). The form of attitude taken strongly agrees and agrees with the nurse on the risk of contracting hepatitis B after one needle stick as much as 110 (94%), the nurse strongly agrees and agrees to provide nursing care to patients with infections such as hepatitis that must be previously vaccinated against hepatitis 106 (90 , 6%), the nurse strongly agrees and agrees that 98 (83.8%) must wear gloves when installing the infusion and injecting, the nurse strongly agrees and agrees that when processing contaminated equipment, 98 (83.8%) must wear gloves, Nurses strongly agree and agree that closing the syringe with one-handed technique (recapping) can prevent the risk of needling injuries as much as 98 (83.8%), the nurse strongly agrees and agrees that sharp trash such as syringes must be placed in a transparent container as many as 109 (93.2%), the nurse strongly agrees and agrees with the exposed gauze and if it is exposed to blood/body fluids when performing nursing care for patient infection, first aid with disinfectants as much as 97 (84.7%), Nurses strongly agree and agree as soon as they receive help as above, report the exposure to special services/ occupational

medicine as many as 93 (79.5%), Nurses strongly agree and agree 19 (17.2%) did not have the possibility to serve and contact HIV positive patients, the nurses strongly agreed and agreed that they should not assume that all patients had the potential for infectious diseases as much as 15 (12.8%), the nurses strongly agreed and agreed that they needed to be careful -Be careful when treating wounds that have the potential to produce blood/body fluids as much as 92 (78.6%), the nurse agrees and strongly agrees that if you see the safety box is full, I immediately close it and replace it with a new one as much as 92 (78.6%) , The nurse strongly agrees and agrees that when an emergency is needed in handling patients, CPR is required, PPE is not so important as much as 7 (6%), the nurse strongly agrees and agrees that it is necessary to perform nursing care. Care for infected patients to patients who were not infected even though the gloves were not exposed to blood as much as 47 (41.3%), Nurses strongly agreed and agreed. Although treating infected patients was sure not to be infected when working according to SOP 117 (100%).

Attitude is a trend towards overt behavior and attitude is not the only determinant, but many other factors influence the emergence of behavior. A low level of knowledge will result in negative attitudes, lack of accumulation, interference with other tasks, time-consuming, and lack of understanding in work (Jeong and Park, 2009). Leadership support with the highest proportion at the level of hospital health services was 45 (84.9%), whereas at Public Health Center the highest proportion was 5 (9.4%), while at the health service level The highest proportion of clinics was less supportive of 7 (12.7%). As for the form of support provided by the hospital often and always by the director working together to ensure safe working conditions as many as 64 (54.7%), the hospital often and always provides support with PPIs who play an active role in socializing standard precautions as many as 106 (90 , 6%), the hospital often and always provides support with the head of the room doing safety talking about Universal precautions before morning application as many as 107 (91.4%), the hospital often and always provides support with active PPIs in the supervision of Universal precautions as many as 103 (88%), hospitals often and always provide support in the form of rewards by the PPI team, 27 nurses who obey in implementing Universal precautions (23.1%).

According to Snehandu B. Karr's theory, one of the 5 determinants of behavior is social support. A person's behavior tends to require legitimacy from those around him. In this case, health behavior, in this case, is the application of universal precautions, nurses need the support of those around them (Notoadmodjo, 2010). In making efforts to implement universal precautions, the support of the leaders is very meaningful in implementation. Continued leadership is important in empowering health workers to implement universal precautions (Mabachi *et al.*, 2016).

Nurses who wash their hands in the application of universal precautions in health care are when the nurses come in contact with body supplies as many as 106 (90.6%). Nurses wash their hands in the application of universal precautions in health care when the nurse before taking action as many as 105 (89.7%). Nurses wash their hands in the application of universal precautions in health care when the nurse before contact with patients as many as 92 (72.6%). Nurses wash their hands in the application of universal precautions in health care after contact with patients as many as 63 (53.8%). As for the nurses who did not wash their hands in the application of universal precautions in health care, 56 (47.9%) were the nurses after contact with the environment. Nurses who did not wash their hands during the step Hand Hygiene were 56 (47.9%).

According to Atkinson et al. 2013 maintenance of hand hygiene saves more time by using alcohol gel which is then rubbed on the hands rather than using running water which takes a lot of time. Hand hygiene and health significantly reduce the number of disease-causing microorganisms on both hands and arms and minimize cross-contamination (e.g. from health workers to patients). Failure to practice proper hand hygiene and hygiene is considered to be a major cause of infectious nosocomial infections in health care and spreads multiresistant microorganisms and has been recognized as an important contributor to the onset of outbreaks (Atkinson *et al.*, 2016).

Low adherence to handwashing is related to academic and habitual training during nursing education, while others point to individual, group, and institutional factors[14] The highest proportion of the use of PPE by nurses is wearing protective shoes as much as 117 (100%). 5 nurses did not use PPE handscoon (4.3%), 21 (17.9%) nurses who did not use PPE aprons, 74 (63.2%) nurses who did not use PPE aprons. Using glasses as much as 51 (53.6%)

nurses who do not use protective caps as much as 35 (29.9%). A study conducted in Delhi reported that only 10.1% of self-reporting needle stick injuries by nurses mainly from the OB / Gyn Word Health Organization department mentioned that three levels of control were hospital-acquired infection prevention: The first was administrative control, which was steps are taken to ensure that the entire system works effectively. The second is environmental and engineering control, including environmental cleaning, spatial separation, and space ventilation. The third is to further reduce the risk of transmission and includes self-protection, namely the provision of appropriate personal protective equipment (PPE) (e.g. masks, respirators) (Atkinson *et al.*, 2016).

The highest proportion of infectious waste treatment in the application of universal precautions was 99 (84.6%), The highest proportion of non-infectious waste treatment in the application of universal precautions was 101 (86.3%), The highest proportion of waste treatment was Selection between infectious and non-infectious linens put in bags according to type in the application of universal precautions as much as 97 (82.9%), the highest proportion of waste treatment counting and recording linen in the room in the application of universal precautions was 99 (84.6%). The existence of various health service facilities, including hospitals, clinics, and health centers, will produce both liquid and solid waste. Hospital solid waste is better known as hospital waste. Solid waste (garbage) is something that is not used, disliked or something that must be disposed of, generally the result of solid human activity (Pittet 1, S Hugonnet, S Harbarth, P Mourouga, V Sauvan, S Touveneau, 2000). Hospital solid waste is all hospital waste in the form of solid as a result of health service activities consisting of medical and non-medical waste (Ministry of Health of the Republic of Indonesia, 2006). According to the World Health Organization waste treatment, for environmental cleaning use adequate procedures for routine cleaning and disinfection of environments and frequently touched surfaces. For the handling of linen, one should pay attention to the time of transportation and handling the goal of avoiding the transfer of pathogens from the patient to the environment (Word Health Organization, 2007).

5. Conclusion

The higher the level of health services, the higher the average application of universal precautions. The application of universal precautions at the level of health care has the same level of care in treating patients. It is better if the infection prevention and control unit conducts training and the head of the room directs the nurse about universal vigilance when a shift change occurs, so that nurses can apply precautions universal according to the SOP in addition to completing PPE in each ward, checking water in the ward, implementing supervision and giving sanctions to nurses who violate the application of precautions universal, so that nurses can implement precautions universal according to the SOP imposed by the hospital.

Acknowledgments

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