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4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

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Abstract.

Background: Standard precautions practices are crucial management skills among nurses against the highly infectious novel COVID-19.

Aims: The study aimed to investigate the level of nurses’ compliance with standard precautions, and identify the main challenges experienced by nurses during their work with infected COVID-19 patients.

Methods and materials: A cross-sectional survey design was used. The study was done at the beginning of the pandemic in public and private hospitals in Jordan. About 386 front-line nurses filled out the online questionnaire.

Results: Most of the participants revealed dealing with COVID-19 patients (73.6%). Generally, nurses demonstrated a good level of compliance with standard practices (71%). The staff reported that they mostly adhere to performing hand hygiene after all procedures (65.8%). On the other hand, they were the least adherence to maintaining a physical distance of patients and staff of at least 6 feet apart (28.5%).

Conclusion: Strict observation of the compliance of nurses with the standard precautions practices is crucial to be maintained at the highest level to eliminate the spreading of COVID-19 among other community members. More efforts should be come to light including continuous training and education sessions to enhance nurses’ level of knowledge and practice concerning controlling the outbreak of the novel pandemic.

Key words. Transmission-based precautions, COVID-19, Practices, Compliance, Nurses, preventive measures, Jordan.

What’s known?
- Standard precautions practices are the most crucial and basic skills among all health care providers.
- The pandemic of novel COVID-19 is a serious challenge for healthcare authorities from the aspects of spread, treatment, and prevention.
- Little evidence about the compliance of nurses with standard precautions and practices and the main challenges that may face during the novel COVID-19.

What’s new?
- Generally, nurses demonstrated a good level of compliance with standard precautions practices (71%).
- Most nurses revealed performing hand hygiene after all procedures as standard precautions practice (65.8%).
- The main challenges faced by nurses were fear of infecting family members, work overload, fear of contracting the virus, and shortage of staff.

Introduction.

The novel COVID-19 is a highly infectious respiratory disease that is described as severe acute respiratory syndrome coronavirus (SARS-CoV-2). This novel pandemic is performing a global threat leading to high mortality and morbidity rate among the population [1]. The outbreak of the disease limits the quality of health care and leads to crises in health care services due to the scarcity of resources, workload, and lack of infection control policies [2]. All of these mentioned factors were contributing to the non-compliance of Health Care Workers (HCWs) to Standard Precautions (SPs) that were known as universally accepted policies and guidelines for infection control practices [3]. These practices help to protect HCWs from getting infected while introducing care to infectious patients and reducing the spread of infection among patients simultaneously [4]. In Jordan, a rabid accelerating curve in confirmed COVID-19 cases which alarming the situation among HCWs and threatening healthcare institutions [5].

Nowadays, the pandemic of novel COVID-19 became a serious challenge for healthcare authorities, communities, and other healthcare agencies from the aspects of spread, treatment, and prevention [6]. The Centers for Disease Control and Prevention (CDC) recognized that the common symptoms of COVID-19 range from mild symptoms such as fever, fatigue, cough, dyspnea, sore throat, muscle pain, loss of smell and taste, and abdominal discomfort [1] to severe symptoms of pneumonia, acute respiratory distress syndrome, renal failure, shock that leading to end organ damage [7]. Recognizing risk factors and identifying the severity of each case is vital to improve the quality of patient care and help the care providers to introduce the best care and improve patient safety.

Based on the available knowledge, COVID-19 could be spread through droplets, airborne, and contact as modes of transmission [8]. However, according to current literature and evidence, the COVID-19 virus is transmitted between people through respiratory droplets and contact routes [9]. This requires taking the recommended practices of airborne precautions for any situation involving the care of COVID-19 patients. Also, it should follow the recommendation of the circumstances and settings in which aerosol-generating procedures and support treatment are performed [10]. Contact precautions as well are important recommendations to be followed through the emphasis on the importance of frequent hand hygiene, environmental cleaning, and disinfection, as well as the importance of maintaining physical distances and avoidance of close, unprotected contact with people with respiratory symptoms [11].
Nurses are on the frontlines in managing and treating the patients who were suspected or diagnosed as positive carriers of COVID-19 since they were the heaviest takers of direct contact with those infected persons [12]. This put all nurses at high risk of being infected with this highly contagious virus, which is alarming to the situation of health care authorities [6]. Infected nurses and other medical staff lead them to arrive at critical stages of both physical and psychological problems [13]. Psychological threats including stress, anxiety, and worriedness replicate the risks of mediating morbidity of COVID-19 among nurses [14].

This alarming situation calls for the urgent need to develop a strategy to consider all these factors especially the workload for long hours their duty, rest, exercise, protective clothing, and psychological counseling among medical staff to avoid infection [15]. Without taking the appropriate effective measures, the situation will be out of control which will eventually lead to massive pandemics worldwide [16].

Healthcare-Associated Infections which is referred to an infection that is acquired during the process of introducing care during hospitalization [17]. Healthcare professionals are constantly exposed to many types of microorganisms that can cause serious or lethal infections [18]. Nurses, in particular, are more exposed to infection during their routine nursing care activities with their patients. Although infection control measures that can be taken such as hand hygiene, and commitment to the protective handling of equipment is a low cost, simple, and protective [19], it requires restrictive staff accountability and behavioral adaptation to the current situation. This is could be achieved by continuous training to enhance the adherence to SPs, which were designated to minimize the spread of microorganisms [20].

Unfortunately, poor knowledge and compliance with SPs were revealed in many studies that could explain the high number of medical staff who were infected by COVID-19 among hospitalized patients [21,2]. In Jordan, little evidence is available about the level of adherence of nurses to SPs practices and the main challenges that faces they during their care of COVID-19 patients. Hence, the purpose of the current study is to investigate the level of transmission-based practice precautions, and the main challenges experienced by nurses with the management of COVID-19 patients at Jordanian hospitals during the outbreak of the pandemic.

Materials and methods.

Research design:
A descriptive cross-sectional survey design was used.

Settings:
The study was conducted in different sectors including governmental, private, and university-affiliated settings in which they represent the healthcare sector in Jordan.

Sample and sampling technique:
Data were collected conveniently from 386 nurses recruited from different Jordanian hospitals. The target population for the current study included all nurses who were assigned to bedside care. Whereas, the accessible population included the available nurses who accept to participate in the current study. The inclusion criteria were (1) nurses who provide direct contact with patients who were infected with COVID-19; (2) educational level of diploma, bachelor and a higher degree in nursing; (3) agreed to participate; and (4) have an experience of at least one year in nursing. Exclusion criteria were all nurses in the managerial position including head nurses of the assigned wards or nurses who have an administrative role in their clinical settings. Data were collected through an online form that was filled out and submitted through a Google survey link that was started from the period 8 February 2021 to the period 21 February 2021. The data were collected from different departments and units in the hospitals. Data were collected by sending the questionnaire link to different WhatsApp groups from a different departments. Each group contains around 30 participants. Also, the link was distributed among different nursing clubs and forums via Facebook groups.

Ethical consideration:
The study protocols were reviewed and approved by the ethics committees at Al al-Bayt University (# 4/2020/2021). There were no known risks from participating in the study. An information sheet was provided to each participant describing the purpose of the study, confirming the privacy, anonymity, and confidentiality of participants, and the voluntary nature of their participation. Informed consent was implied by completing and returning the survey. Permission was obtained from the copyright holder to use the questionnaire developed by Afemikhe et al. [1].

Data collection:
After obtaining the IRB approval. The data was collected by preparing an electronic questionnaire through a specialized internet website-Google forum (via docs.google.com/form). This e-questionnaire enabled the participants to review and answer the questionnaires more conveniently. The prepared electronic questionnaire was embedded in an electronic attachment link and sent to participants through a social-media application (WhatsApp and Facebook). A timeframe was set for participation in filling out the questionnaire for two weeks. After the expiration of the period, the form was deactivated.

Instrument:
Nursing staff compliance with SPs practices was measured by a self-built tool based on principles issued by the World Health Organization (WHO), and CDC measures precautions during the COVID-19 pandemic. The questionnaire was developed by Afemikhe et al. [1]. The questionnaire was administered in English because Jordanian nurses can understand and answer questions in the original language of the tool. The instrument is composed of three parts. Part-A includes demographic characteristics items such as gender, age, qualification, years of experience, and marital status. Other demographics were added in the current study such as the name of the hospital, department, and health sector if the nurse previously deal with COVID-19 patients, if the nurse was diagnosed previously with COVID-19, if the nurse receive the vaccine of COVID-19, or if the nurse willing to receive COVID-19 vaccine. Part B includes items on transmission-based precaution practices which consist...
of 12 items with the options of a 4-point Likert scale “Never, Sometimes, Often, and Always”. Higher scores indicate higher compliance of nurses with SPs practices. Furthermore, the classification of practices was leveled according to the total scores as follows: 0-50 was considered as poor level, 50-70 classified as fair level, and 70-100 classified as good practice. Part C includes items on perceived challenges experienced by nurses that could affect their adherence to transmission-based precaution practices. It consists of 15 closed-ended questions with options for “Yes” or “No” answers [1]. The questionnaire was tested for validity and reliability in previous studies and was found valid and reliable. The reliability values obtained from the split-half reliability test for parts (B & C) were (0.79) and (0.85) respectively [1].

Results.

Participants’ Demographics:

A total of 386 participants from different sectors in Jordanian hospitals completed the questionnaire. Table 1 provides a detailed description of the participants’ demographics.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30.7 (6.2)</td>
<td></td>
</tr>
<tr>
<td>Nursing experience in years</td>
<td>7.9 (5.9)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>128 (33.2)</td>
<td>179 (46.4)</td>
</tr>
<tr>
<td>Female</td>
<td>258 (66.8)</td>
<td>207 (53.6)</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma &amp; Bachelor</td>
<td>323 (83.7)</td>
<td></td>
</tr>
<tr>
<td>Postgraduate studies</td>
<td>63 (16.3)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>140 (36.3)</td>
<td>57 (14.8)</td>
</tr>
<tr>
<td>Single</td>
<td>246 (63.7)</td>
<td>329 (85.4)</td>
</tr>
<tr>
<td>If nurses have a chronic disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>57 (14.8)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>329 (85.4)</td>
<td>284 (73.6)</td>
</tr>
<tr>
<td>Type of settings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governmental</td>
<td>197 (51.0)</td>
<td>167 (43.3)</td>
</tr>
<tr>
<td>Private</td>
<td>86 (22.3)</td>
<td>219 (56.7)</td>
</tr>
<tr>
<td>Military</td>
<td>46 (11.9)</td>
<td>207 (53.6)</td>
</tr>
<tr>
<td>University-affiliated</td>
<td>57 (14.8)</td>
<td>179 (46.4)</td>
</tr>
<tr>
<td>If dealt previously with COVID-19 patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>284 (73.6)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>102 (26.4)</td>
<td></td>
</tr>
</tbody>
</table>

Note: SD=Standard Deviation, %= percentage.

Nursing compliance with Standard precautions practices with COVID-19:

Generally, the findings of the current study showed a good level of SPs practices by nurses. Since, they revealed performing hand hygiene after all procedures (n=254, 65.8%). Whereas they demonstrated the least compliance with the physical distancing of patients and staff at least 6 feet apart (n=110, 28.5%) (Table 2).

Based upon the categorization of transmission-based practices by nurses they mostly maintained a good level of practice (n=274, 71.0%) (Table 3).

Challenges experienced by nurses while dealing with COVID-19 patients:

The majority of nurses mainly had a fear of getting the infection to family members (87.6%). Followed by the perception of their work overload (86.8%) during the pandemic, fear of contracting the virus (87%), and shortage of staff (86%). About two-thirds of nurses reported that lack of motivation and lack of training programs were other factors that affect their compliance with SPs practices (Table 4).

Discussion.

The current study investigates the level of nurses’ compliance with SPs and identifies the main challenges that are faced during their work with infected COVID-19 patients. The findings of this study reported a good level of SPs skills which were consistent with the international guidelines revealing the high responsibility and accountability of nurses toward dealing with COVID-19 patients.

The frequency of good practices of SPs is consistent with other studies among healthcare professionals in Ghana, and Denmark [22,23]. Adherence of nurses to infection control policies could be related to the conduction of online conferences about COVID-19, and adherence to the guidelines of healthcare institution’s policies, since they were the frontliners in fighting against the pandemic during out breaking the virus. On the other hand, other studies in Saudi Arabia and Jordan indicate poor compliance of HCWs toward the SPs [1,24,25]. This is could be related to the lack of face-to-face training programs to enhance their knowledge and understanding of infection control practices during the pandemic.

Jordanian nurses who participated in the current study have a higher proportion in the item of performing hand hygiene after all procedures. This means that around one–third of the participants do not perform hand hygiene after each contact or procedure with the infected COVID-19 patients, surprising results indicate the alarming situation of maintaining the crucial and efficient step in eradicating the transmission of contracting the virus. This was contradict the results that were found among Nigerian nurses when they reported that they generally maintained hand hygiene practices with a percentage of 89.1% [1]. The non-compliance of nurses with hand hygiene practice needs a call for behavioral changes along enhances their accountability about the importance of frequent hand washing since it is the most efficient and simplest way to prevent the
Table 2. Compliance of Transmission-Based Practice by Nurses.

<table>
<thead>
<tr>
<th>Transmission-based precaution practices</th>
<th>Never (0) F (%)</th>
<th>Sometimes (1) F (%)</th>
<th>Often (2) F (%)</th>
<th>Always (3) F (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand hygiene is performed after all procedures</td>
<td>13 (3.4)</td>
<td>34 (8.8)</td>
<td>85 (22)</td>
<td>254 (65.8)</td>
</tr>
<tr>
<td>Using of Personal Protective Equipment for SARS-CoV-2 patients requiring healthcare facility admission with aerosol-generating procedure</td>
<td>29 (7.5)</td>
<td>47 (12.2)</td>
<td>106 (27.5)</td>
<td>204 (52.8)</td>
</tr>
<tr>
<td>Using PPE for every patient with first contact</td>
<td>32 (8.3)</td>
<td>69 (17.9)</td>
<td>114 (29.5)</td>
<td>171 (44.3)</td>
</tr>
<tr>
<td>Covering mouth and nose with a tissue when coughing or sneezing</td>
<td>16 (4.1)</td>
<td>23 (6.0)</td>
<td>99 (25.6)</td>
<td>248 (64.5)</td>
</tr>
<tr>
<td>Provision of a waste receptacle to dispose of tissue after use</td>
<td>13 (3.4)</td>
<td>41 (10.6)</td>
<td>137 (35.5)</td>
<td>195 (50.5)</td>
</tr>
<tr>
<td>Offering masks to a symptomatic patient upon arrival to the ward</td>
<td>21 (5.4)</td>
<td>55 (14.2)</td>
<td>119 (30.8)</td>
<td>191 (49.5)</td>
</tr>
<tr>
<td>Offer of the mask to asymptomatic patients on arrival to the ward</td>
<td>26 (6.7)</td>
<td>69 (17.9)</td>
<td>129 (33.4)</td>
<td>162 (42.0)</td>
</tr>
<tr>
<td>Providing resources for performing hand hygiene in or near the waiting area</td>
<td>17 (4.4)</td>
<td>62 (16.1)</td>
<td>142 (36.8)</td>
<td>165 (42.7)</td>
</tr>
<tr>
<td>Educating patients about the disease</td>
<td>17 (4.4)</td>
<td>62 (16.1)</td>
<td>142 (36.8)</td>
<td>165 (42.7)</td>
</tr>
<tr>
<td>Performing clinical triage for patients on admission</td>
<td>31 (8.0)</td>
<td>67 (17.4)</td>
<td>123 (31.9)</td>
<td>165 (42.7)</td>
</tr>
<tr>
<td>The physical distancing of patients and staff at least 6ft apart</td>
<td>41 (10.6)</td>
<td>93 (24.1)</td>
<td>142 (36.8)</td>
<td>110 (28.5)</td>
</tr>
<tr>
<td>Controlling of number of visitors around a patient</td>
<td>38 (9.8)</td>
<td>90 (23.3)</td>
<td>120 (31.1)</td>
<td>138 (35.8)</td>
</tr>
</tbody>
</table>

Note: F= Frequency, %=Percentage

Table 3. Categorization of Transmission-Based Practices by Nurses.

<table>
<thead>
<tr>
<th>Categorization</th>
<th>Score range</th>
<th>F (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0-50</td>
<td>39 (10.1)</td>
</tr>
<tr>
<td>Fair</td>
<td>50-70</td>
<td>73 (18.9)</td>
</tr>
<tr>
<td>Good</td>
<td>70-100</td>
<td>274 (71.0)</td>
</tr>
</tbody>
</table>

Note: F= Frequency

Table 4. Challenges Experienced by Nurses while caring COVID-19 Patients.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Yes F(%)</th>
<th>No F(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of infecting a family member</td>
<td>338 (87.6)</td>
<td>48 (12.4)</td>
</tr>
<tr>
<td>Fear of contracting the virus</td>
<td>336 (87.0)</td>
<td>50 (13.0)</td>
</tr>
<tr>
<td>Work Overload</td>
<td>335 (86.8)</td>
<td>51 (13.2)</td>
</tr>
<tr>
<td>Shortage of staff</td>
<td>332 (86.0)</td>
<td>54 (14.0)</td>
</tr>
<tr>
<td>Lack of motivation (hazard allowance)</td>
<td>299 (77.5)</td>
<td>87 (22.5)</td>
</tr>
<tr>
<td>Lack of training program</td>
<td>290 (75.1)</td>
<td>96 (24.9)</td>
</tr>
<tr>
<td>Seeing elderly suffering</td>
<td>288 (74.6)</td>
<td>98 (25.4)</td>
</tr>
<tr>
<td>Overcrowding in the ward</td>
<td>285 (73.8)</td>
<td>101 (26.2)</td>
</tr>
<tr>
<td>Availability of Personal Protective Equipment</td>
<td>276 (71.5)</td>
<td>110 (28.5)</td>
</tr>
<tr>
<td>Ineffective communication among administrative</td>
<td>263 (68.1)</td>
<td>123 (31.9)</td>
</tr>
<tr>
<td>Shortage of instruments and supplies</td>
<td>261 (67.6)</td>
<td>125 (32.4)</td>
</tr>
<tr>
<td>Less commitment to policies and procedures</td>
<td>251 (65.0)</td>
<td>135 (35.0)</td>
</tr>
<tr>
<td>Inadequate testing material and delay in results</td>
<td>234 (60.6)</td>
<td>152 (39.4)</td>
</tr>
<tr>
<td>Stigmatization</td>
<td>231 (59.8)</td>
<td>155 (40.2)</td>
</tr>
<tr>
<td>Moral injury</td>
<td>225 (58.3)</td>
<td>161 (41.7)</td>
</tr>
</tbody>
</table>

Note: F= Frequency, %=Percentage
spreading of COVID-19 among patients and staff. This could be related to the staff shortage, workload, lack of knowledge regarding the guidelines they followed in their healthcare institutions, and the cumbersome nature of sanitizing hands a lot of times [26].

Generally, nurses in the current study experienced many challenges that restrict them to maintain a high level of compliance with the SPs practices including fear of infecting family members, work overload, fear of contracting the virus, and shortage of staff, respectively. This result was not surprising, since HCWs were still in fear about the nature of the virus and its management of it, so they in worry to transmit the novel virus to themselves or other family members. This was consistent with a study conducted by Clark et al. [27], who pointed out that most nurses worried to be vehicles for transmitting the virus among their family members who already had co-morbidity conditions, immunocompromised, or fragile to bear this virus. Also, the results of nursing staff shortage and work-pressure load are in agreement with other studies that reported lack of resources, workload, and lack of adherence to infection control policies as the main contributing factors of noncompliance of nurses with the SPs practices.

Conclusion.

Strict observation of the compliance of nurses with the SPs practices is crucial to be maintained at the highest level to eliminate the spreading of COVID-19 among other community members. More concentrated efforts should come under light including continuous training and education sessions, seminars, and conferences to enhance nurses’ level of knowledge and practice about controlling the outbreak of the novel pandemic. Furthermore, it is recommended to conduct studies covering all HCWs in different geographical areas with frequent follow-up to identify areas of non-compliance with SPs practices. Also, Jordanian staff must perform their patients’ care while being protected from the transmission of COVID-19, by completely adhering to SPs practices guidelines, and policies.

Limitation.

This study has a limitation in collecting the data among nurses conveniently, which could affect the generalizability of data. However, great efforts were done to recruit many participants from different sectors in Jordanian hospitals including governmental, private, and University-affiliated sectors. Secondly, the data were collected during the period of lockdown which restrict the collection of data using the self-reporting method without observing nurses’ compliance with SPs.

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