

arisen where everybody is afraid due to the increasing number of infected cases. Morbidity and mortality are increasing day by day due to infection by SARS-CoV-2 though gradually the mechanism of development of pathology in the patients is being understood. Forensic nurses too have to adapt to the changing scenario due to COVID-19 pandemic both in the practice of forensic nursing as well as in the education of the forensic nurses.

In the environment of this pandemic people when staying at home due to lockdown restrictions taken for the prevention of this disease, the risk for all types of abuses in the families have started increasing. This abuse may vary from intimate partner violence, elder abuse, child abuse or sexual abuse and this is partly due to isolation and partly due to spending more time in the family [5]. Children face the risk of separation from the caregivers, maltreatment, social exclusion and violence due to stress of lockdown measures. The stress in the caregivers has increased due to the closing of the schools. Taking care of children and earning for them is putting stress on the parents resulting in the domestic violence involving persons prone to violence under the stress. Forensic nurses can be very useful to this vulnerable group when they are alone in the hospital during the treatment for this disease or whenever they left alone due to the death of the caregivers. Forensic nurses who are trained to report safely cases of violence to children, intimate partner violence and elder abuse can be very useful in such circumstances. Closure of schools and increased burden of taking care of children during the day time has stressed the parents due to which domestic abuse has increased [6]. Unemployment has furthered the risk of child abuse [7].

Elderly abuse too has increased due to limited interpersonal contact policies during COVID-19 and they face loneliness and social isolation [8] and added to this is the fear of avoiding this disease and that too with limited resources which are dwindling low due to falling in stock markets and financial scams to which elder people are more prone when they are away from their families as the social visits, too have decreased due to social distancing policies during COVID-19. They face increased risk of physical, sexual and psychological abuse and exploitation of their finances due to competitive care in the families when the resources of the families are decreasing due to poor earnings [9]. Elders are more prone to physiologically and psychologically to this pandemic [10]. Elders have been de-prioritized in health care during COVID-19. Human rights violations of elders are more discernible during this pandemic and it is increased up to 37% in some countries [11].

When dealing with cases of accidents and crimes in the old age nursing homes let it be clear that old people more prone to infections by COVID-19 and forensic nurses should be prepared accordingly [12] and this applies equally to the old clients and victims who are on palliative care at homes and nursing homes [13].

Inter-Personal Violence [IPV] which is normally 1 in 4 females and 1 in 10 males is likely to increase as victims of IPV are trapped with their abusers due to lockdown and it is more difficult to report and get help in the era of COVID-19 [14]. In India, mostly female suffer due to patriarchal mindset [15]. Impotence has increased during this lockdown period resulting in frustration and agitation leading to increased IPV [16]. Physical trauma increased by 1.8 times in one of the studies and high-risk abuse doubled during this pandemic [17]. Forensic nurses who are trained can assess different domains of IPV whether these are physical, sexual or psychological and report to the concerned authorities.

COVID-19 is also affecting the workplaces. Role of Forensic nurses in occupational injuries is also well known and they may have to be involved in the examination of the burn cases, smoke inhalation cases of toxic fumes and smoke, workplace terrorism, mass disasters and interviewing of the responders and survivors of a crisis [18]. Persons can get the infection of CORONA-19 at workplaces and in Spain 22% of workers were health care professionals out of which 76% were women employees and it can be biological occupational accident or disease. There can be cases of compensation due to improper faulty equipment and protective measures and forensic nurses may be involved in such cases themselves or dealing with such cases [19].

In the emergency trauma cases come and there is a need to follow protocols to prevent infections to the operating and treating team [20] and forensic nurses have to follow these protocols as forensic nurses get involved in collecting biological samples from the medico-legal cases in the emergency. Though various hospital services are modified due to the load of the CORONA-19 cases but emergency services have to remain open to tackle the cases of trauma. Non-operative management, minimising the number of treating personnel and telemedicine remain the main strategies for the management of the emergencies [21]. Road traffic accidents were the main cause of trauma to the bones but cases of trauma decreased whereas fragility fracture incidence remained unchanged [22]. Patients of trauma will have collateral implications due to infection by CORONA-19 [23].

Forensic nurses often get involved in the medico-legal management of such cases. Forensic nurses are taking care of the residents of institutions where culprits and refugees are kept usually there is overcrowding due to less space and there is increased risk of infection and more so in the era of CORONA-19 both to the inmates as well as health workers and caregivers [5]. Nurses should be properly qualified and trained to treat such people otherwise inmates may suffer harm [24]. Old people living in nursing homes are especially vulnerable to this disease [12].

In a video by the International Association of Forensic Nurses [IAFN] it has been beautifully depicted and emphasized that it is better to take help from the forensic nurses which are safe rather than not taking help at all [25]. Whatever forensic examinations are to be carried out there is a need to carry it safely taking care of oneself as well as the victim [26].

Telehealth is a good solution to the victims of crime which can be advised by the forensic nurses in certain situations [5, 27] but it will exclude the elderly people who have no access to broadband and are not good in using modern apps [8].

In the crime scene investigation and post-mortem examination, forensic nurses are involved and there is a need for the protocols to avoid infection in this era of pandemic CORONA-19 [28]. A virtual autopsy can be utilized in the forensic post-mortem examination cases in a positive case of COVID-19 [29]. This will help in the prevention of infection to health workers in positive cases of this disease [30] including forensic nurses.

New guidelines for conducting the post-mortem examination in the post-COVID-19 era are being established [30, 31] and new guidelines have been issued by the Royal College of Physicians where autopsy in hazardous infection in the group III has been described and recommendations have been given for autopsy in COVID-19 cases as the SARS-CoV-2 falls in the group III of the hazardous organisms [32]. There may be autopsies on the cases which yet not have been diagnosed as COVID-19. Guidelines and protocols have been

established to proceed with autopsy in such cases [31] [33, 34]. Forensic nurses too need to know in detail about these guidelines to remain relevant and updated in the post-mortem examination team. The workflow of forensic autopsies in COVID-19 cases have been formulated and this can be a good source of help to forensic nursing who are dealing with crime scene investigation and post-mortem examination.

RT-PCR is the recommended method to diagnose the COVID-19 in the dead bodies or High homology for COVID-19 Disease viral gene sequencing and further recommended not to use IgG/IgM in the dead bodies for the diagnosis of this infection[31, 35]. Even suspicious dead body should be handled carefully if the person had travelled, came in contact with or exposed to the disease or lived in clusters where there are active cases of this disease; or they had shown sign and symptoms of fever or respiratory difficulties and some tests have shown the probability of this disease but false-negative cases should also be kept in mind [31].

Education delivery in Post COVID-19 scenario is also a big issue in the times of lockdown and students have left the institutions [36]. Even when the lockdowns will be removed issue of safe delivery of lectures and lab work will remain for a sufficient time to come and we need to modify the things as the situation develops in the coming times. We have to keep safe the students as well as faculty and other workers in the institutions simultaneously not jeopardizing the delivery of educational services [18, 36]. There is online education in forensic nursing too [37] and such programs do not pose any such issues in the Post COVID-19 era and will be useful.

Management of the Cases

The practice of forensic nursing will differ upon the Zone of practice i.e. Red Green or Orange. Green is the area in which there is no reported case since last 21 days or till date. Red Zone is the area where the rate of doubling is fast and the area where there are most active cases. Orange is the area which is neither green nor red [38]. There will be containment and buffer zones in the red and orange zones which can be marked keeping in view the instructions of the health ministry [39]. A confirmed case of CORONA -19 is the epicentre of the disease and an area of 3 km around it is the containment zone (40). A buffer zone is an additional area within 7km radius in rural areas and 5 km in the urban areas [40].

CORONA-19 virus has multiple entry points. Crime scene examination can pose a threat to the examiners and others during the COVID-19 and use of PPE kit will greatly reduce the danger and simultaneously it will avoid contamination of the evidence. It will help in protecting from trans-dermal absorption drugs e.g. Fentanyl [41]. Crime scene analysis through Laptops and 3D technology will help in virtual crime scene investigation especially in the COVID-19 Scenario [42]. 3D LASER Scanning can be very useful in crime scene investigations in such scenarios for the investigation of crimes including scenes of fire and accidents [43]. 3600 -degree imaging and cameras can too be helpful in such scenarios to accurately record the crime scene without touching the crime scene [44]. Space exploration technologies have been used at the crime scene to investigate blood and semen stains and gunpowder residues and primer residues using portable X-ray fluorescence systems for analysing non-destructive chemical composition as done on the planets [45].

Precautions

Early identification and testing will help in the prevention of the spread of the disease by taking precautionary measures. Even asymptomatic persons can spread the disease [2].

Universal precautions suggested by WHO should be followed e.g. frequently washing hands with soap and sanitizing hands with alcoholbased rubs and not touching your face and following respiratory etiquettes like coughing in the flexed elbow [3].

Guidance has been provided by IAFN to practice forensic nursing in an era of COVID-19. Innovations and flexibility have been advised in the practice of forensic nursing. Alternate sites other than emergency room may be utilized which are HIPPA compliant with the Use of PPE kits has been advised. There is a need to assure the patients and victims that taking services of forensic nurses is safe and it is open. Collaboration with a multidisciplinary team is the best thing to do [27].

Plans should be developed for increased load work during this time [27]. Guidance from local health authorities may be sought in case of an outbreak of the disease in the community [46].

Though Do It Yourself [DIY] rape kits have been suggested in the COVID-19 pandemic in some cases and remote sexual assault the examination has been done by this kit by the patient on video conferencing with a forensic nurse and has been said to be the safest way to conduct such examinations in COVID-19 Scenario [47] but in cases of sexual assault examination by the forensic nurse is always better than the Victim administered Evidence Collection Kit DIY kit as the examination is invasive and test done at the hands of the experts will always be better as the use of DIY kit can give a false sense of security of the evidence [48].

If an examination of sexual assault cases is to be conducted in the red zone or hot zone assistance should be taken from a nearby cold centre and some parts of the examination e.g. history taking and labelling and handing over of the samples can be done in the cold zones and to protect the samples surface to be used should be cleaned by bleach so that the samples do not become fomites or an outer box can be used which can be discarded later on [49].

When post-mortem examination is to be done safety of workers and safety of the team handling the dead body and doing the autopsy work should be one of the priorities along with keeping the samples safe while being packaged and transported. Dignified and safe management of the dead body should be kept in mind [31].

Material and Methods

Google scholar and Google search with keywords of forensic nursing and Post COVID-19 was done and relevant articles read and most relevant articles cited in this paper.

Discussion

This is the proper time to plan the forensic nursing practice for the post-COVID-19 scenario. It is important this is done in such a way that everything which was being done prior to this pandemic continues to be practised. The precautions which are needed to be taken should be taken so that our clients who are usually victims of violence do not get an additional disease in this contagious pandemic as this disease carries a lot of morbidity and mortality.

It is also important that when this practice of forensic nursing is carried out health workers are protected too by creating proper awareness and carrying out the instructions properly.

Rape is one of the common crimes in the USA as one in six women and one in 33 men have experienced rape or threat of rape and that too by a known person (eight of ten cases). Due to the fear of the COVID-19 disease victims of sexual assaults may not be seeking advice as the number of people seeking consultation has decreased during this period according to one of the forensic nurse practitioners [50].

Physical and sexual violence increased during the lockdown period in Australia in one of the surveys and fear of getting the disease was a barrier to seeking advice [51].

Advocacy groups are helping the victims remotely due to the fear of the disease rather than accompanying them to the hospitals and the same may be true for the prosecutors. Teleconferencing with the advocacy group may be the solution. Police people too are responding to wearing PPE kits [50].

Proper plans and protocols should be developed for the medico-legal care and treatment of cases brought to forensic nurses in this pandemic as the plans and protocols have been developed by other departments in the wake of COVID-19 e.g. Radiology departments. Early detection of positive cases and preventing exposure to other health workers in the department by taking proper precautions by preventing droplet infection and maintaining social distancing and by allowing workers to work from home who can manage the things sitting at home [52].

Procedures in forensic nursing may have to be modified so that there is no contamination of samples or by samples, while maintaining the integrity of the procedures and help can be taken from the modified protocols of examining cases of sexual assaults. Taking of samples, preserving and packaging, and delivery of samples to the police may need to be changed to prevent viral contamination of samples and limit the number of people in the contamination or hot zones. Care is needed so that samples and packages do not act as fomites to spread the disease to the police officer and scientists in the labs [49].

Examination place may be a different modified place with everybody in PPE kits and the experience for the victim may be very much dehumanizing. Communication may be very difficult when everybody is covered with PPE kits and personal rapport with the victim may be a difficult situation. Patients may in the wards where sharing of space is common and the privacy may be lacking which may be very much uncomfortable in such situations and moreover, their support persons are missing in such situations which may be family members, friends and advocacy group members. [49,51].

Unless proper steps are taken in the institutions for the prevention of the COVID-19 disease where people are kept in custody there are chances of increased risk to the inmates and forensic nurses have to take care of increased standards of custodial healthcare services [24].

Forensic Nursing Education is delivered by routine lectures, practical classes or on hand practice, seminars, tutorials and assignments. Out of these modalities lectures, seminars and tutorials are possible with online methods by video conferencing which have the utility of the interaction with the students and they can clarify their doubts and pose little difficulty but for the practicals, special modules need to be developed. Various apps have been utilized by the institutions and teachers to deliver the online lectures in India e.g. Zoom meetings. If

the allotted time is over for the teacher in an institution WhatsApp discussion can be very useful as the query of one of the students answered by the teacher can be very helpful even to the shy students and it also promotes thinking and solution found by the search on the search engines like Google search.

Asynchronous pre-recorded study material can be sent to the students which they can study at their own pace and feasibility but it has the financial repercussions too [36].

As far as assessment is concerned online assessment is possible but has its own issues and difficulties.

Viva voce is a possible form of assessment by video conferencing. Students can be given assignments and they can be assessed or Google forms too can be used for the assessment purposes. All these methods have their own limitations and disadvantages.

Conclusion

It is better that, victims and clients seeking forensic nursing help should continue to seek the help of forensic nurses and they should be made aware this help is available that too in such an environment where there are no chances that they will acquire this infection. Forensic nurses should practice in such a way they make it safe for their clients, other health workers and for themselves by adopting safety measures as per the protocol of local health authorities. Forensic nursing education should continue too by adopting online facilities which are very safe in the COVID-19 pandemic and psychomotor skills development of forensic nursing students should not be ignored but taken care of a visit to the required labs and crime scenes by taking full precautions so that they do not get the infections and they do not spread the infections. As the knowledge about COVID-19 disease changes with more research we will have to change the strategies to deal with the cases coming to the forensic nurses.

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