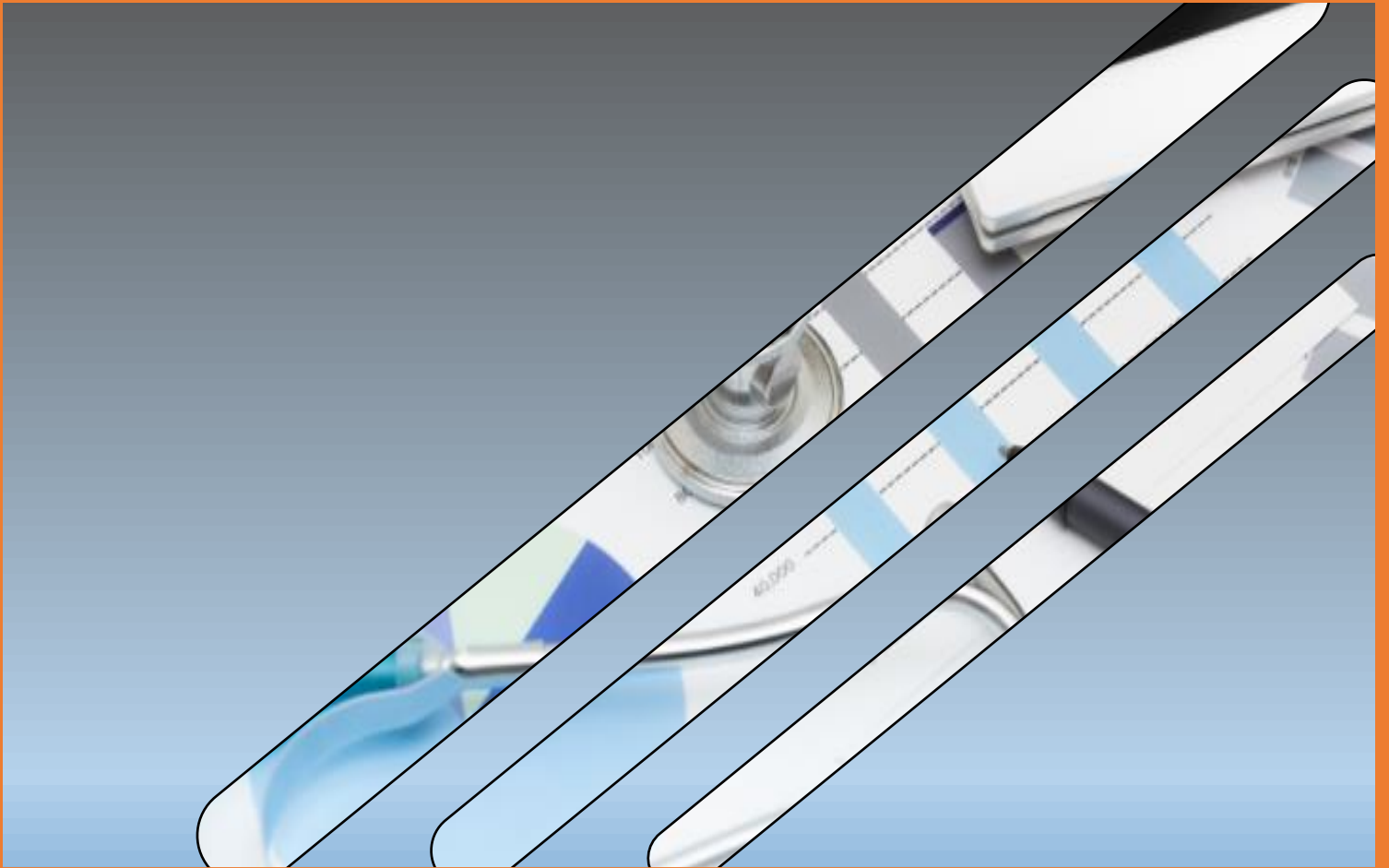




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Tomato Flu: A Short Commentary

ARJUN SINGH PHOKELA¹, ANCHAL RAPOTRA¹, ANAMIKA¹, ANAMIKA RAGHWA², SAHIBLEEN KAUR^{*2}

ABSTRACT

Tomato flu is a contagious disease caused by infection. Its source is said to be a strange virus not known to common knowledge. It is an anonymous virus the symptom of its infection is a blister formed all over the body in the shape of a tomato hence it is called the tomato fever. The blisters appearing all over the body are similar in appearance to a tomato its victim are children below the age of 5 years. The virus effects the hands mouth and feet. It is supposed to be an infection limited to itself and gets to be subsided in 7 to 10 days. The diagnosis are done as per the clinical history and physical check up. Since it is an etiological agent its line of treatment and vaccination are a question mark and needs to be researched upon at top priority. Covid 19 has imparted a lesson for outbreak alert in propagation and management of such cases during emergency condition by repositing drugs and vaccines.

INTRODUCTION

This disease, "Tomato Flu" is full of infection which has cropped up from an unidentified viral disease. It was first identified as a viral organism and first detected in India during May 2022 in the state of Kerala. It got its name 'Tomato Flu' owing to its chief symptom of blisters in tomato shape appearing everywhere on the body. It is also called "tomato influenza" and tomato fever because of its resemblance to a tomato.¹

It is found in children upto the age of five. Adults are rarely infected due to their strong immunity to the tomato influenza virus. Tomato Flu is considered as an infection commonly born from a virus whose impact results in results in hand, feet and mouth disease (HFMD).

HFMD is normally caused by Cocksackie virus. However, the A16 Cocksackie virus causes only mild illness. A Patient may recover naturally within 7-10 days even if there is no medical intervention. This virus infects cattle and pigs in cages. Infection is commonly transmitted through the one being in direct contact

with saliva, bladder fluid, throat secretion or stool of an infected person or animal.

New borns whose mothers become a victim of enteroviral disease at birth may also become infected. However, most enterovirus infected neonate have mild disease. In additions, further investigations and researches are being pursued to diagnose the exact etiology that causes the infection.²

CLINICAL FEATURES

Tomato flu is treated as after-effects of chikungunya or dengue owing to their common sign and symptoms although there is no evidence discovered in their similarity. The common identical symptoms as identified are³:

- Large, spherical blisters in reddish tinge appearing on various parts of the body
- High-grade fever
- Dehydration
- Irritation and rash on the outer Skin.
- Unusual change in complexion giving a discoloration as Patches on hands, knees and buttocks.
- Pain in the abdomen
- Lethargic tiredness,
- Fatigue.

EPIDEMIOLOGY

The disease broke out at the outset in Kollam district of Kerela with eighty two victims being identified in the month of July, 2022. It is speculated that the number of infected cases might increase with time.

The disease was first detected and identified on 6th May in a four year old child in Aryankavu village which lies on the borders of Kerela and Tamil Nadu and was the world's first case. Since, then about 26 cases were identified as positive of hand, foot and mouth diagnosed in Orissa which were also presumed to be tomato flu.⁴



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MANAGEMENT OF TOMATO FLU

Tomato flu is a viral fever having its own limits hence it gets over on its normal self in about 7 to 10 days. This infection is diagnosed by its physical appearance in the patients body and the clinical history. The recovery naturally happens due to its self-limitations.

TREATMENT

The flu is a rare infection that has recently evolved, so there are currently lack of exact or specific drugs available to curb this virus. Since disease-specific treatment is not feasible, owing to the absence of research available, treatment is only prescribed as per the symptoms of other flu using appropriate antipyretics and analgesics. Antibiotics can help only when the blister becomes filled with pus. In this disease, dehydration is observed commonly, so drinking plenty of fluids, such as water, milk etc is recommended. Patients are also advised rest along with precaution of hygiene. The patient should be quarantined for 5-7 days.⁵

OUTBREAK PREPAREDNESS

- When a child develops symptoms of HFMD, guardians and parents should be motivated to seek medical attention at the earliest. One should be alert and aware of any deflection in the patient's normal behaviour. Example include a lack of appetite, persistent nausea and drowsiness.
- Adopting hygiene and regular washing of hands should be emphasized especially after handling diapers and using restroom.
- All surfaces and objects should be thoroughly disinfected with diluted chlorine based bleach.
- A report protocol should be adhered to daily for all levels of healthcare facilities.
- Expansion of Pediatric Intensive Care Unit (ICU) facilities should be top priority with training program for emergency medical personal.
- Provision of a team to provide 24 hour on call service should be imposed in effective areas. Severe cases need to be monitor and assessed.
- Separate examination rooms for fever patients in clinic and paediatric wards be arrange to prevent transmission of other illness to children.
- Medical devices must be sterilized after every use on patients.⁷

PREVENTIVE MEASURES

The outbreak of a sudden strange infection needs to be handled using preventive measures as its prevention

plays a vital role in reducing the effects of the disease and controlling it.

As observed, tomato flu generally attacks infants and preventive measures may be complicated process for them and thoeir parents. Parents in affected areas should be vigilant for the breakout of the disease. Incase of a suspected illnees, the measures appended below may be adopted to prevent tomato flu:¹

- Isolate the infected person to prevent rapid spread of the disease for 5-7 days.
- Owing to its highly contagious nature, the victims should be advised not to scratch the effected surface of the skin or the blisters.
- Avoid contact with the infected patients.
- Children should be advised not to physically touch the rashes or hug infected patients.
- Adopt healthy way of living proper sanitation and clean healthy habits.
- Regular and proper cleanliness and sterilisation of clothes, towel, and materials used by infected persons is advocated
- Dehydration should be avoided
- A balanced diet with ample amount of fluid helps to boost the immunity

DRUGS AND VACCINES UNDER TRIAL

Tomato flu is recently identified disease so drug for its unknown virus treatment and vaccines have yet to be developed. The clinical trials are under process.

STEPS TAKEN BY THE GOVERNMENT

The disease has been identified in the states of Kerela and Tamil Nadu which have already adopted a precautionary alert by keeping surveillance of its borders. The government has advised for screening of such diseases in medical centres and by Anganwadis. Teams comprising of the Revenue Inspector, Police and Health inspector are deployed to pursue the victims of fever and rashes. A close watch in the neighbouring areas was also done to avoid the wild spread of the disease.⁸

CONCLUSION

Tomato flu cases were discovered during a period of high anxiety in the country due to an outbreak of monkey pox. Despite the fact that it is spreading rapidly, the government's immediate actions toward prevention and treatment have significantly limited the infection's spread.

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Impact of Covid-19 on Mental Health

MANJINDER KAUR¹, NAVDEEP KAUR GREWAL^{*1}

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A pandemic affects people and society and creates disruption, anxiety, tension, embarrassment, and xenophobia. Provincial lockdowns were necessary due to the SARS CoV2's rapid human-to-human transmission to stop the disease's further spread. However, it is undeniable that the restrictive restrictions have had an impact on people's social and emotional wellness in all circumstances. Children may experience stress, difficulty, social disengagement, and an unfavourable environment that may have short- or long-term effects on their mental health. Specialists, medical professionals, and paramedics working as a front-line force to combat the COVID-19 incident may be more susceptible to nurture psychological health indications. Knowing how the COVID-19 episode affected various populations' emotional health is almost as important as knowing its clinical highlights, transmission scenarios, and executives. Public awareness campaigns that concentrate on the maintenance of psychological wellbeing in the larger context are urgently needed.

KEYWORDS: COVID-19, Children, Doctors, Impact, Mental Health

INTRODUCTION

A pandemic affects people and society and creates disruption, anxiety, tension, embarrassment, and xenophobia. It is not just a clinical marvel. The severity, spread, and delayed impacts of a pandemic are all directly influenced by an individual's behaviour as a member of society or a local community.¹ Provincial lockdowns were necessary due to the SARS CoV2's rapid human-to-human transmission to stop the disease's further spread. Confinement, social exclusion, and the closure of educational institutions, workplaces, and entertainment venues encouraged people to stay in their homes in order to break the chain of transmission.² However, it is undeniable that the restrictive restrictions have had an impact on people's social and emotional wellness in all circumstances.³

In light of the fact that a rising number of people are being forced to isolate themselves at home in order to stop the spread of the microbe at the cultural level, governments should implement the necessary policies to encourage emotional wellbeing, as advised by experts. Professor Tiago Correia was quoted in his piece as saying that the health systems as a whole are coming together only to combat the COVID-19 event, which can undoubtedly affect the treatment of other illnesses, including emotional wellness, which typically worsens during the pandemic.⁴ The mental health of a person who contributes to the wellbeing of the community varies from person to person and is based on his experience, expertise, and social standing.⁵

Self-isolation and isolation from others can almost certainly have a negative impact on one's emotional health. According to a poll published in The Lancet, isolation from friends and family, missed opportunities, exhaustion, and vulnerability can all lead to a decline in a person's emotional well-being. [6] Actions at the individual and cultural levels are needed to overcome this. In light of the current global situation, both children and adults are experiencing a range of emotions. They might be placed in an unfamiliar situation or environment that could be harmful to their health.⁷

CHILDREN

Children who are homebound and away from their school, friends, and partners may have many questions about the incident and turn to their parents or guardians for guidance. Not all children and parents respond to pressure in the same way. Children may experience stress, difficulty, social disengagement, and an unfavourable environment that may have short- or long-term effects on their mental health.⁸

Expects parents to attempt to be calm, handle the situation deftly, and respond to all of the child's questions as well as possible in order to counteract bad behaviours. Guardians can make an attempt to talk with their children about the COVID 19 occurrence and provide them with some certain facts, numbers, and information. Guardians can encourage children to



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engage in healthy activities like indoor games and certain physical and mental exercises while reassuring them that they are safe at home. Parents and guardians can help their children remain on top of their tests by establishing a home schedule. Guardians should exhibit less strain or unease at home because children pick up on and sense their parents' negative energy. Participating in healthy activities with children can help parents reduce stress and anxiety and improve the situation overall.⁹

DOCTORS

Specialists, medical professionals, and paramedics working as a front-line force to combat the COVID-19 incident may be more susceptible to nurture psychological health indications. Fear of contracting an illness, long hours, lack of defensive equipment and supplies, patient burden, difficulty accessing the effective COVID-19 drug, deaths of their colleagues after using COVID-19, social segregation and isolation from their loved ones, and the critical conditions of their patients may seriously harm the emotional wellbeing of healthcare workers. As the pandemic spreads, the functioning output of health specialists could gradually decline. Health workers should take small pauses in between working hours and handle the situation calmly and casually.⁵

ELDERLY POPULATION

Older people are more likely to experience a COVID-19 flare-up for both clinical and social reasons, such as having a more delicate immune system or another basic medical condition, as well as being more likely to be isolated from their loved ones due to busy schedules. According to medical experts, whether or not they are healthy, people who are 60 years of age or older are guaranteed to contract the SARS-CoV2, which can result in a serious and life-threatening condition.¹⁰

The emotional health of the elderly and disabled can be severely harmed by physical separation caused by a COVID-19 flare-up. The elderly and disabled person is at real risk for psychological health when there is actual estrangement among family members. It may lead to conflict, difficulties, and a terrible situation for them. Older people depend on younger generations for their daily requirements, and isolation can seriously damage a family structure. Nursing home residents who are elderly and disabled may experience shocking emotional health problems. Nevertheless, even something as simple as a call during the pandemic episode might help support elderly people. When

COVID-19 is administered to elderly people who have previously struggled with emotional health concerns, it can also lead to increased pressure, tension, and pessimism. People who have recently been released from isolation can frequently experience vilification and cultivate a variety of emotions. When people come out of isolation, they may feel differently and receive a different welcoming from society. Due to the extraordinary viral nature, those who have recently recovered may need to exercise social seclusion from their family, friends, and other close relationships. Different age groups respond to this social behaviour in unanticipated ways, which can have both immediate and long-term effects.

Health workers working to save lives and protect society may also experience social exclusion, changes in family members' behaviour, and demonization due to their association with the COVID-19 virus. In spite of the fact that they have been determined not to be contagious, previously contaminated individuals and health professionals (managing the pandemic) may cause unfounded sentiments of fear that a person would contract the sickness from coming into touch with them. To avoid the COVID-19 pandemic, however, the current situation needs a clear understanding of how the latest flare-up has affected people's emotional wellbeing across a range of age groups.

CONCLUSION

Knowing how the COVID-19 episode affected various populations' emotional health is almost as important as knowing its clinical highlights, transmission scenarios, and executives. Following a schedule/everyday practise, participating in various healthy activities and sports exercises, spending time with family members, especially children and older people, and taking a break from traditional and online media are all things that can help with overcoming emotional wellness issues. Public awareness campaigns that concentrate on the maintenance of psychological wellbeing in the larger context are urgently needed.

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Understanding Prescribing Cascades: Evaluating Risks and its Management

MOHITA CHADHA^{ID}*, JAISMINE SINGH^{ID}*1

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Prescribing cascade occurs when an adverse drug event is misinterpreted as a new medical condition resulting in a new medication being prescribed to treat the adverse drug event. A simple example is prescription of a proton pump inhibitor (PPIs) to counteract the acid reflux caused by non-steroidal anti-inflammatory drugs (NSAIDs). An interconnection between polypharmacy and prescribing cascade is established where both have a direct influence on each other. Prescribing cascade can affect people of any age but has shown to frequently affect the elderly patients. Assessment tools include both simpler ways like effective communication, clinical process mapping, NO TEARS checklist and complex algorithms like the Screening Tool for Potentially Inappropriate Prescriptions (STOPP), Beers criteria, Medication Appropriateness Index. Identifying and disrupting the prescribing cascade is an important, feasible, and undervalued opportunity to improve patient drug safety.

KEYWORDS: Prescribing Cascade, Polypharmacy, Adverse Drug Event, Elderly Patients, Deprescribing.

INTRODUCTION

Quality healthcare delivery is majorly governed by medications. Irrational prescription of medication poses a huge menace to health systems across the world causing poor health care delivery and wastage of scarce resources. Globally, the risk of adverse events associated with drugs has consistently been observed to increase with the increasing burden on the healthcare system.¹ Prescribing errors affects more than 1.5 million people per year and results in at least 1,90,000 hospital admissions annually.² The ongoing failure to address the problem of medication related adverse events that cause patient harm is on spike. Compounding this, the misinterpretation of the adverse event to a new symptom initiates a cascade of events resulting in polypharmacy. This dynamic needs to be addressed with high priority for patient safety.

What is prescribing cascade?

Prescribing cascade occurs when an adverse drug event is misinterpreted as a new medical condition resulting in a new medication being prescribed to treat the adverse drug event. The idea of prescribing cascade was first described by Rochon and Gurwitz in 1995.³ This prescription of the new drug can be intentional or unintentional. An example to quote is prescription of a proton pump inhibitor (PPIs) to counteract the acid reflux caused by non-steroidal anti-inflammatory drugs (NSAIDs).² These cascades of events are likely to be seen in older patients with multimorbidity, patients

with multiple medical conditions managed by multiple subspecialist physicians and patients having chronic mental health conditions.^{4,5} Prescribing cascade also highlights an important area of concern- problematic polypharmacy.

Polypharmacy has no precise definition. It is described as administration of multiple drugs to a patient.⁶ From over-the-counter drugs to a prescribed medication, every medicine comes with side effects. More the number of drugs administered to a patient, higher are the chances of misinterpretation of an adverse drug reaction (ADR) as a new medical condition. Hence, the direct interconnection between polypharmacy and prescribing cascade is established. Prescribing cascades resulting from both known and unknown ADR jeopardises the patient.²

Risk factors for prescribing cascade

Prescribing a medication is a complex decision making event including close consideration of various factors. Misinterpretation of any event puts the patient into the dangers of polypharmacy. Polypharmacy is directly associated with higher incidence of ADRs which may provide opportunities for prescribing cascades to occur (3). Patient-related risk factors mainly include older patients with multimorbidity, patients with chronic conditions and having multiple sub specialty physicians, those residing in assisted living facilities,



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psychologically ill patients and younger patients primarily with heart disease, diabetes, stroke and cancer.⁵ Looking through the sex and gender lens, women are at greater risk for ADRs than men.⁷

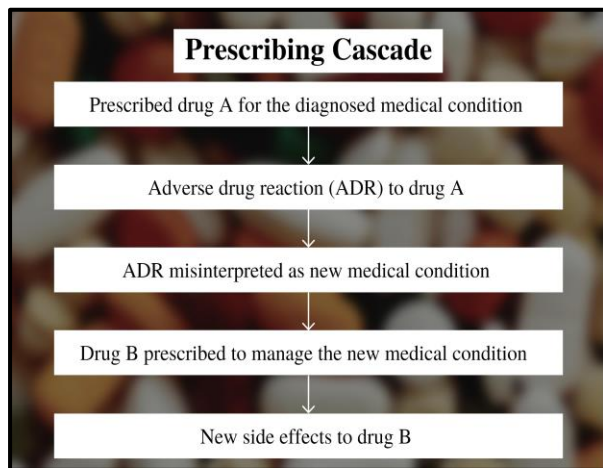


Figure 1. The prescribing cascade

Elderly population is at higher risk of prescribing cascade than the younger population.⁸ In a cohort study, a diuretic was prescribed to counteract the ankle edema caused by calcium channel blockers in 9.5% of elderly patients.⁹ Another well recognised example of prescribing cascade in elderly population is symptoms arising from use of drugs like antipsychotics or metoclopramide. This leads to initiation of antiparkinson therapy. According to a case-control study of 3512 patients aged 65 to 99 years, antiparkinson therapy was likely to be prescribed 5.4 times more to patients who had received antipsychotics in the past 90 days.⁸

Irrational prescribing of drugs, poor communication between physician and patient, poorly maintained medical records and automated refill systems are some

of the contributing factors for prescribing cascade.^{1,2,5} High proportions of patients report that they are not explained the side effects of the prescribed medication¹⁰, hence, they fail to identify an ADR. Approximately 15% of patients stop treatment due to an ADR without the physician's consultation. Updated medical records of patients among different sub specialty physicians is necessary to prevent prescribing cascade.

Commonly reported drugs in prescribing cascade (Table 1)

The commonly reported drugs in prescribing cascade is described in table 1.

Assessment tools for prescribing cascade (Figure 2)

Real time identification of prescribing cascades is a challenging task. Simpler ways like mass communication among the population regarding the side effects of medications to facilitate better communication with their physicians. There are tools to assist clinicians with deprescribing of drugs and to ensure quality prescribing like the Screening Tool for Potentially Inappropriate Prescriptions (STOPP) and Beers criteria, as well as implicit measures such as the Medication Appropriateness Index. The NO TEARS checklist informs clinicians the importance of addressing polypharmacy. Clinical process mapping is another simple yet efficient way of preventing prescribing cascade and promoting deprescribing wherever necessary. It is a process that can be done in an inpatient or outpatient setting, at the bedside while interviewing the patient, or after a clinical encounter.^{4,14}

How to prevent prescribing cascade

The therapeutic benefit of medication should be weighed well against the harmful effects for patient

Initial drug therapy	Adverse drug reaction	Subsequent drug therapy
Calcium channel blockers ⁽⁹⁾	Ankle edema	Diuretics
Nonsteroidal anti-inflammatory drugs ^(2,11)	Increased blood pressure, Acid reflux	Antihypertensives, Proton pump inhibitors
Antipsychotics ⁽⁸⁾	Extrapyramidal symptoms	Antiparkinson therapy
Thiazide diuretics ⁽¹¹⁾	Hyperuricemia	Incontinence treatment
Antiepileptics ⁽¹²⁾	Rash, Nausea, Vomiting	Topical corticosteroids, Metoclopramide, Domperidone
Metoclopramide ⁽¹¹⁾	Movement disorder	Levodopa
ACE inhibitor ⁽¹³⁾	Cough	Antitussives
Cholinesterase inhibitor ⁽³⁾	Urinary incontinence	Anticholinergics

Table 1. Commonly reported drugs in prescribing cascade

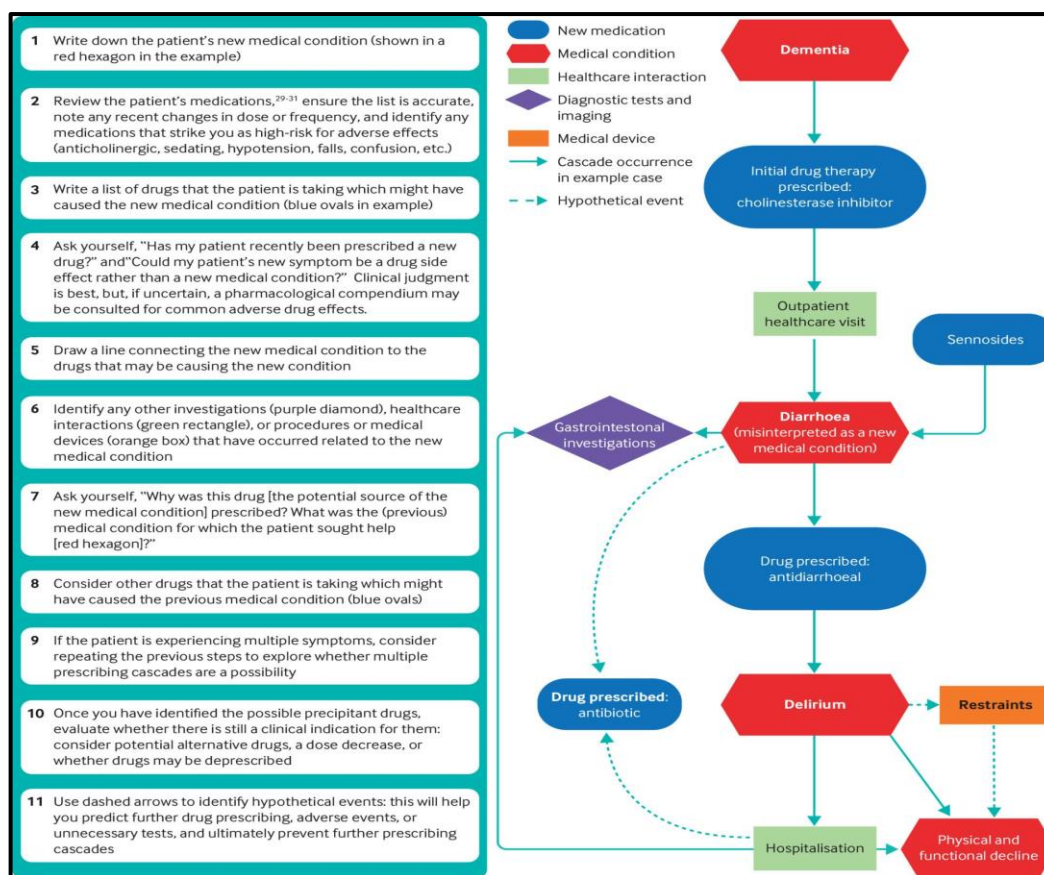


Figure 2. How to create a clinical process map⁽¹⁴⁾

safety. As prescribing cascade is precipitated by ADRs, early detection of an ADR can be helpful in preventing the cascade. This can be done by patient education to improve awareness regarding the potential side effects of new medications. Educational interventions can be done by seminars, print media or face-to-face contact.¹

Documenting response to therapy can help the clinician to assess whether the new symptom is a response to medication or actually a new condition. Most ADRs occur due to high dosage of medication, starting therapy at low doses and periodic evaluation will reduce the risk of ADRs.² Clinicians should consider deprescribing wherever necessary. Deprescribing should be viewed as initiating a "therapeutic intervention" similar to initiating clinically appropriate therapy. Furthermore, healthcare systems should adopt streamlined approaches to medication tracking, this might help identify potential medications for deprescribing and reduce physician, staff, and patient burden.⁵ Non-pharmacological approaches should be considered before drug therapy.

The Trial of Nonpharmacologic Interventions in the Elderly (TONE) suggested that lifestyle modifications and reduced sodium uptake reduced need for antihypertensive therapy in about 40% of the intervention group.⁸

A systematic approach to prescribing should include: clearly define the patient's problem, setting the therapeutic objectives, patient education regarding the benefits and risks of the therapy, periodic review of drug therapy, discontinuing unnecessary medications, considering non-pharmacologic alternative strategies; considering safer alternative medications; using the lowest possible effective dose; including all necessary beneficial medications.^{8,15}

CONCLUSION

Prescribing cascade is an increasingly common problem in medical practice. Futile poly medication results in polypharmacy which not only presents major health risks but also raises various ethical and economical issues.

Clinicians should implement ways for cascade detection and secondary prevention. This should include mindful practice and rational prescribing of drugs. Identifying and disrupting the prescribing cascade is an important, feasible, and underappreciated opportunity to improve patient drug safety.

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An Integrative Review of Transformational Leadership Style and Burnout: Implications for Nurse Leaders

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INTRODUCTION: Transformational leadership improves the motivation and performance of others through different ways. Nurse leaders can use prior evidence to reimagine how transformational leadership can be applied in nursing while considering the uniqueness of nursing context vs other contexts. Nurse leaders additionally need to pay attention to the negative downside of transformational leadership on leaders themselves because it may have significant consequences on nurse leader burnout.

PURPOSE: To review the evidence and determine how transformational leadership characteristics are associated with burnout among nurse leaders.

MATERIALS AND METHOD: An integrative review of transformational leadership in nursing and nurse leader's burnout was conducted using Whittemore and Knafl's (2005) methodology. PubMed and Google Scholar were used in the literature search. Multiple combinations of the keywords and phrases "transformation leadership," "nursing leadership," "transformational leadership and burnout," or "burnout among nurse leaders" were used for the literature search. To capture all articles relevant to this review, the inclusion criteria were set to peer reviewed and English articles published between 2002 and 2020 that reported on transformational leadership and nurse leader's burnout.

RESULTS: Taking into consideration the main findings, their common meanings were organized and integrated as themes including transformational leadership in nursing, burnout of nurse leaders, and burnout of transformational leaders.

CONCLUSION: This integrative review explored how transformational leadership might be associated with burnout amongst nurse leaders. Overall, transformational leadership style was established as an effective leadership style at the organizational and employee levels in terms of, for example, job satisfaction. Literature showed that transformational leadership style has an association with burnout among leaders from contexts other than nursing. For nurse leaders, how this leadership style has an association with burnout needs to be investigated.

KEYWORDS: Transformational Leadership, Burnout, Nurse Leaders, Nursing

INTRODUCTION

Transformational leadership is a particular leadership approach wherein the leader enhances the interest among employees to view their work from a different standpoint (Bass & Avolio, 1994). Although many leadership theories have been studied greatly, transformational leadership has been the most supported theory (Avolio et al., 2009). Additionally, this leadership style is one of the five Magnet components that help a hospital get and maintain Magnet status (ANA, 2010). Despite its importance and its many benefits on employees (Wang et al., 2021), it is not without some disadvantages especially for leaders themselves.

Some studies done in contexts other than nursing have investigated the negative impacts of the transformational leadership style on leaders themselves (Arnold et al., 2015). This indicates a need for more research in the nursing context, as leadership tasks vary between nursing and other industries. Broadly speaking, transformational leadership is when a leader can transform followers' thoughts and actions towards

higher potential, morale, and ethical standards (Bass & Avolio, 1994). Connelly and Arnold (2011) suggested that leaders who aspire to be transformational may consider adapting this style of leadership to take the advantage of its benefits while mitigating the psychosocial stress associated with leadership demands and requirements. While acknowledging the importance of transformational leadership style, nurse leaders' wellbeing needs to be looked at. Burnout among nurse leaders as an aspect of wellbeing will be discussed in this review.

Within nursing, leadership roles were found to be demanding, and personnel filling this role are susceptible to burnout (Kelly et al., 2019). Nurse leaders are particularly exposed to emotional exhaustion, which is an aspect of burnout (Cao & Naruse, 2019). Burnout is defined as a state of continuous psychological stress within work life (Leiter & Maslach, 2009). When nurse leaders experience burnout, or are at risk of burnout, the work environment is put at risk, which has negative impacts on staff nurses (Flynn &



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Ironside, 2018). Nurse leaders, having the most demanding roles in the hospital environment, may consider leaving their positions (Warden et al., 2021).

Although some researchers have investigated the relationship between the transformational leadership style and burnout in different sectors, research among nurse leaders is limited. Among hospitality managers, transformational leadership style was negatively related to emotional exhaustion and depersonalization as aspects of burnout (Zopiatis & Constanti, 2010). Leaders who employ transformational leadership style would likely have difficulty expressing negative feelings such as anger (Bass & Avolio, 1994). Based on transformational leadership theory, displaying negative emotions is perceived as inappropriate for the role model engaging in transformational leadership (Bass & Avolio, 1994). However, when workers are not able to express emotions, adverse health outcomes such as burnout can result (Zapf, 2002).

Within sport field, a study found that one of the influencing factors for perceived burnout among leaders is the demands associated with the transformational leadership style especially if a leader has low emotional intelligence score. This is when a coach or a leader has poor skills of perceiving, interpreting, understanding, and managing emotions in themselves or others will not be a predominantly transformational leader (Ugrenovic et al., 2020).

Among nurses who are not leaders, transformational leadership style was shown to be the most effective leadership style to decrease burnout (Liu et al., 2019). Given nurse leaders are critically needed to shape the environment through the direct interaction with their staff (Wei et al., 2018), the use of transformational leadership (TFL) style among nurse leaders and their personal burnout needs to be investigated.

BACKGROUND

Burnout from work-related demands are central concerns because they cause a high cost related to the increased turnover among nurses (Diehl et al., 2021). Many studies have focused on burnout among nurses who are not leaders (Kelly et al., 2021), but burnout among nurse leaders needs to be studied due to their susceptibility to burnout associated with the high involvement in nursing management and quality control (Khalid, 2021). Nurse leaders are especially exposed to emotional exhaustion, which is one of the burnout hallmarks (Cao & Naruse, 2019). There are 30%

of nursing leaders, including registered nurse (RN) leaders who held titles in the organizations as either clinical managers (CMs), senior CMs, or directors, leave their positions due to burnout and feeling exhausted with the work demands (Kelly et al., 2019). Nurse leaders experience a decrease in job satisfaction and a higher intent to leave because of experiencing high stress levels and burnout (Kelly et al., 2019). According to the World Health Organization (2019) burnout is defined as “an occupational phenomenon” when workers experience stress for a prolonged period within the workplace. Burnout is characterized by feeling exhausted, which decreases employee’s efficacy and increases feelings of detachment from their job (WHO, 2019). In a sample of hospitality managers in Cyprus, transformational leadership was found to be negatively related to emotional exhaustion and depersonalization as aspects of burnout (Zopiatis & Constanti, 2010). The correlations and hierarchical regressions revealed a negative but moderate to insignificant association (Zopiatis & Constanti, 2010). However, this needs further exploration.

Transformational leadership is based on a theory, which recognizes the need for promoting change within the organization through improving the motivation, spirit, and performance of the followers (Bass & Avolio, 1994). The four components of transformational leadership theory include charisma or idealized influence, inspirational motivation, intellectual stimulation, and personal attention or individualized consideration (Bass & Avolio, 1994). Charisma or idealized influence is when a leader makes personal sacrifices for employees’ benefits by going beyond an individual self-interest being a role model (Bass & Avolio, 1994). Inspirational motivation is by helping followers experience passion to reach the desired goals. For intellectual stimulation, transformational leaders encourage creativity and enhance employees to explore new ways to solve issues or improve a situation. Lastly, individualized consideration is when transformational leaders give personal attention, support, and encouragement to employees (Bass & Avolio, 1994).

Transformational leadership is one of the five Magnet components that help a hospital get and maintain Magnet status (ANA, 2010). Additionally, transformational leadership theory has been widely advocated, it is important to understand whether transformational leadership can affect not only the followers but also leaders; and if so, why and under what conditions these relationships occur. Given that within the transformational-leadership literature,

burnout is one of the most frequently measured well-being outcomes (Hildenbrand et al., 2018); researchers continue to call for further study of negative impacts of transformational leadership on leaders themselves so that they be more aware of the potential personal downside associated with it (Bass and Riggio's, 2006). Investigating the association between transformational leadership and burnout of nurse leaders need to be done as there is insufficient information on the impact of transformational leadership on nurse leaders.

PROBLEM IDENTIFICATION

Studies are limited in terms of reviewing the literature on the relationship between transformational leadership and nurse leader burnout. To address this gap in the literature, previous inconsistencies in the literature will be examined and calls for examination of link between TFL and burnout among nurse leaders will be answered. Studies exploring the association between leadership styles and burnout were done with nurses who are not leaders. However, nurse leaders also experience emotional exhaustion, which is one of the burnout hallmarks in addition to leadership tasks (Cao & Naruse, 2019). Therefore, examining burnout of transformational nurse leaders is needed.

Researchers call to investigate the negative impacts of transformational leadership style for leaders themselves (Bass & Riggio, 2006). Responding to the calls, this proposed study tends to investigate how transformational leadership style might leave nurse leaders prone to burnout. Additionally, this integrative review (IR) would result in an understanding of the effect of transformational leadership style on burnout among nurse leaders, thus, considering transformational leadership attributes in their leadership practices would be aware of the negative effects on its connection with burnout. The incidents of burnout and emotional stress and exhaustion would be decreased among nurse leaders. Studying the correlation between transformational leadership style and burnout among nurse leaders will increase the chances of providing transformational leadership training modules and enacting transformational behaviors. Additionally, it addresses a change relevant to current modern practice in the form of transformational leadership.

PURPOSE

The purpose of this IR is to review the evidence and determine how transformational leadership characteristics are associated with burnout among

nurse leaders. Integrative review methodology was applied in efforts to obtain a comprehensive description of current knowledge and robust foundations for future knowledge generation. The investigation of the relationship between transformational leadership and burnout among nurse leaders addressed this question, what is the relationship between transformational leadership style and burnout among nurse leaders?

MATERIALS AND METHOD

Design: Whittemore and Knafl's (2005) with its five-part integrative review methodology including problem identification, literature search, data evaluation, data analysis, and result presentation were used. The approach involved steps based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and a four-phase flow diagram (Page et al., 2021).

Identification and Screening: A literature search was conducted in January 2022 using PubMed and Google Scholar. In PubMed there were multiple combinations of the keywords and phrases, which included (Transformational leadership OR "Leadership"[Mesh]) AND (Nurse Leaders OR Managers OR Executives OR Administrators "Nurse Administrators"[Mesh]) AND (Burnout OR "Burnout, Professional"[Mesh]). Whereas, in Google Scholar keywords included transformational leadership AND nurse leaders AND burnout. These terms were searched within abstracts, titles, and keywords. To capture all articles relevant to this review, the inclusion criteria were set to peer reviewed and English articles that reported on transformational leadership and leader's burnout including nurse leaders. Although articles on burnout among nurse leaders are included, articles on employees' burnout who are not leaders are excluded due to the scope of this integrative review. For example, a study examined the relationship between nurse leadership style and nurse burnout was excluded (Wei et al., 2020). Studies that described transformational leadership and burnout among leaders from disciplines other than nursing were included. Studies conducted for other leadership styles were excluded if they didn't include a transformational leadership component.

A PRISMA flow diagram (figure 1) was developed based on the literature review procedures and article selection (Figure 1). In total, 23 articles were populated in google scholar (n=18) and PubMed (n=5). In the search strategy, articles within reference lists were examined. Although articles on "transformational leadership" and

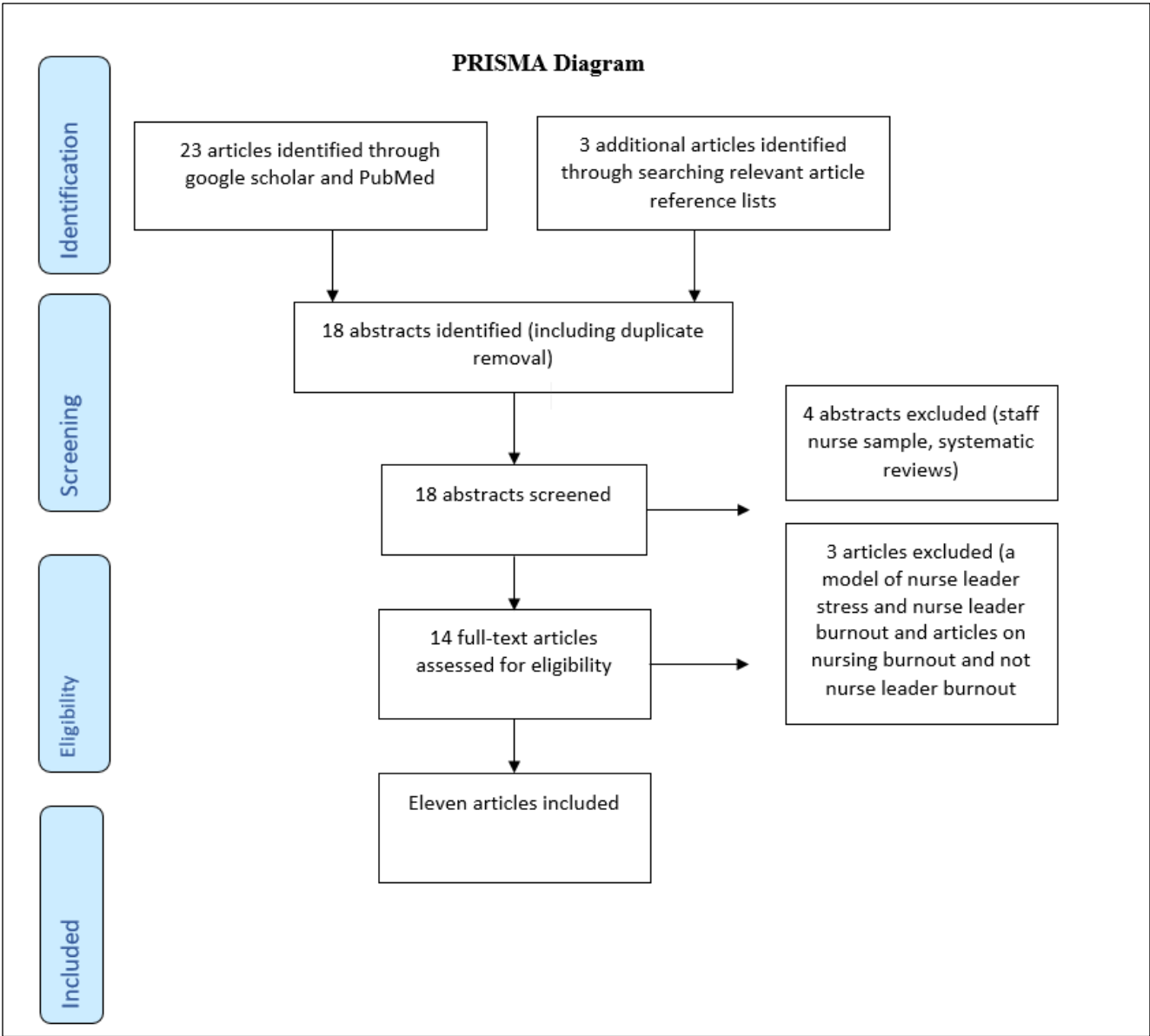


Figure 1. Article Selection Procedure (Page et al.)²⁴

“nurse leader burnout” are included in this review, articles on “employee burnout” were excluded. Studies that described a mixed sample of leaders from different industries other than nursing were included only if they used transformational leadership style in their work. Only 11 articles met inclusion criteria and are discussed within the context of this review.

Search Methods and Outcome: A literature table was created abstracting information from the 11 articles on study purpose and design, measures, sample, location, findings, and limitations (Table 1). This review included articles on the effectiveness of transformational

leadership within nursing (n=3), burnout of nurse leaders (n= 4), and burnout of transformational leaders (n= 4). In this review, there were leaders from nursing (n=7), hospitality managers (n=1), collegiate coaches (n=1), mental health teams (n=1), and leaders from a wide range of industries (n=1).

The articles derive from the United States (n=4), Cyprus (n=1), Canada (n=1), Japan (n=1), Belgium (n=1), Jordan (n=1), Pakistan (n=1), and a multinational study (n=1). Study designs included non-experimental cross-sectional study designs (Adriaenssens et al., 2017; Alloubani et al., 2019; Arnold et al., 2015; Asif et al., 2019;

Cao & Naruse, 2019; Lappalainen et al., 2019; Ugrenovic et al., 2020; Zopiatis & Constanti, 2010), large mixed methods study (Kelly et al., 2019), non-experimental prospective study design (Corrigan et al., 2002), and pre/post intervention study design (Ceravolo & Raines, 2019).

The most common measures of burnout used among the 11 studies were the Maslach Burnout Inventory with confirmed validity and reliability (n=3), Oldenburg Burnout Inventory with confirmed validity and reliability (n=1), Copenhagen Burnout Inventory with confirmed validity and reliability (n=2), Professional Quality of Life with confirmed validity and reliability (ProQOL) (n=1), and Japanese Burnout Inventory (J-BI) with confirmed validity and reliability (n=1).

The transformational leadership was measured using Multifactor Leadership Questionnaire (MLQ) (5x-Short) across five articles with confirmed validity and reliability (n=5). One article used the Finland version of Transformational Leadership Scale (TLS) with confirmed validity and reliability (n=1) and one other article used transformational leadership seven item scale developed by Carless et al. with confirmed validity and reliability (n=1).

Quality Appraisal: Each article was rated by the first author according to the John Hopkins Level of Evidence and Quality Guide (Dang & Dearholt, 2017). This scale measured level of evidence on a scale of I-V. Level I represents experimental studies, level II represents quasi-experimental studies, and level III represents nonexperimental studies (Dang & Dearholt, 2017). Level IV and V are based on non-research evidence (Dang & Dearholt, 2017). Quality of papers was rated as high, good, and low. High-quality reports are articles with consistent generalizability and recommendations based on sound scientific evidence. Good-quality evidence is indicative of generally consistent results, sample size, control, and recommendation (Dang & Dearholt, 2017). Low-quality studies possess significant flaws that limit the conclusiveness of the report (Dang & Dearholt, 2017).

All the articles in this review were rated at level III evidence and were of good quality (n=10) except for one article, which was rated as level II evidence with high quality (n=1). Most studies included in this review are older than five years because of the limited number of studies that fit the inclusion criteria. Six studies used non-probability sampling and five did not mention the sampling type.

Data Analysis and Presentation: Data were extracted from primary sources based on study characteristics and methods related to the concept of transformational leadership and leaders' burnout. A summary form was completed with the following data extraction fields for each individual study: citation, design and method, sample and setting, major variables, measurements and tools, outcomes, and level of evidence. Data from the summary forms were used to critically synthesize and summarize findings across studies, presenting results in tabular format (synthesis tables).

RESULTS

Taking into consideration the main findings, their common meanings were organized and integrated as themes including transformational leadership in nursing, burnout of nurse leaders, and burnout of transformational leaders. Three studies discussed transformational leadership within nursing (Alloubani et al., 2018; Asif et al., 2019; Lappalainen et al., 2019). Three studies talked about the impact of transformational leadership on burnout among leaders (Arnold et al., 2015; Zopiatis & Constanti, 2010; Ugrenovic et al., 2020; Corrigan et al., 2002). Four studies focused on burnout among nurse leaders (Kelly et al., 2019; Cao & Naruse, 2019; Adriaenssens et al., 2017; Ceravolo & Raines, 2019).

TRANSFORMATIONAL LEADERSHIP IN NURSING

Using a cross-sectional descriptive study design in three private hospitals and three public hospitals, Alloubani et al (2018) investigated managers' leadership styles, from the perspective of registered nurses, and its effects on the quality of nursing care. Transformational leadership style was found to be the most used leadership style by nurse managers who work in the private sector in comparison with the public hospital (Alloubani et al., 2018). Alloubani et al. (2019) found that there was a significant positive relationship among the transformational leadership and quality of nursing care ($r = 0.87$; $p < 0.001$). Alloubani et al. (2019) also reported there was a significant positive relationship among the transformational leadership and job satisfaction ($r = 0.81$; $p < 0.001$). Lappalainen et al. (2019) in their study from Finland using cross-sectional study design with 161 RNs showed that transformational leadership has a significant relationship with medication safety ($r = 0.541$; $p < 0.001$).

A cross-sectional study design was used with 17 government hospitals and 600 registered female nurses

in Pakistan, using structural equation modelling, reporting that transformational leadership has a significant relationship with structural empowerment ($\beta = 0.57$; $p < 0.01$), and structural empowerment has a significant relationship with quality of care ($\beta = 0.39$; $p < 0.01$) (Asif et al., 2019). Structural empowerment was found to be a mediator between leadership style and quality of care. Additionally, transformational leadership was found to have a positive significant relationship with job satisfaction ($\beta = 0.43$; $p < 0.01$), and job satisfaction has a significant relationship with quality of care ($\beta = 0.23$; $p < 0.01$). Job satisfaction was found to be a mediator between leadership style and quality of care (Asif et al., 2019).

Nurse leaders who use transformational leadership principles create a climate where employees have a high quality of care (Alloubani et al 2019; Asif et al., 2019). Nurse leaders that adopt transformational leadership see gains in staff satisfaction, which in turn may have an important effect (Alloubani et al, 2019; Asif et al., 2019).

BURNOUT OF NURSE LEADERS

Increased amounts of stress contribute to high rates of burnout, staff and leader turnover, and decreased satisfaction amongst nursing leaders (Kelly et al., 2019). Approximately 30% of nursing leaders leave their positions due to burnout and feeling overwhelmed with the demands of work (Kelly et al., 2019). Kelly et al. (2019) carried out a mixed methods study with qualitative and quantitative data to explore burnout, stress, and compassion satisfaction in multiple levels of nursing leadership. The Professional Quality of Life (ProQOL) was used to measure burnout, stress, and compassion satisfaction. Six hundred seventy-two nurse leaders, across 29 hospitals were sent out an electronic survey with three parts to evaluate demographics, results of the ProQOL, and questions regarding work satisfaction (Kelly et al., 2019). A phone interview was also scheduled with nurse leaders for the qualitative portion of the study, to inquire about organizational satisfaction, satisfaction with work, satisfaction with their work life balance, and recognition. The results showed that the overall job satisfaction increased with each level of nursing leadership, with directors demonstrating the least amount of burnout and stress, proposed to be due to the possibility of skill-attainment by the experience of being in leadership over an extended period (Kelly et al., 2019). Clinical nurse managers showed the highest levels of stress and burnout with those having the least

amount of experience being higher than others (Kelly et al., 2019). The role of managing individuals was associated with emotional drain leading to compassion fatigue, and that a work-life balance was crucial to effective leadership (Kelly et al., 2019). Nurse managers with constant exposure to an environment of stress will ultimately experience burnout (Kelly et al., 2019). Hence, continuous exposure to stress is linked to burnout in leaders contributing to decreased job satisfaction and increased turnover rates (Kelly et al., 2019). Among many contributors of burnout among nurse leaders, Kelly et al. (2019) highlights work life balance, compassion satisfaction, as well as overall satisfaction with work as important factors for decreasing stress.

A study in Japan using cross-sectional study design on 93 home-visiting nurses has shown that nursing managers are especially exposed to emotional exhaustion (EE) (Cao & Naruse, 2019). Low levels of personal accomplishment burnout dimension were especially likely to occur when workers were subjected to overload and had a high degree of responsibility. This was often the case for nursing managers, who thus presented a strong predisposition towards problems in this respect (Cao & Naruse, 2019). Among other sociodemographic factors, burnout was related to age (Cao & Naruse, 2019). Thus, the risk of developing burnout was especially acute among women aged 40–50 years old. Furthermore, full-time workers were more likely to suffer burnout than those working part time (Cao & Naruse, 2019). Nursing managers often bear a heavy workload, and this is a major risk factor for burnout among them (Cao & Naruse, 2019). In addition to providing nursing care, they need to establish productive relationships with other personnel, both within the hospital and elsewhere, and make good use of health and social resources (Cao & Naruse, 2019). Time pressure of having insufficient time to complete the required job arrangement is positive predictor for emotional exhaustion and depersonalization ($p < 0.001$). In which nurse managers' relational coordination of the quality of collaborative relationships among practice members is negatively related to depersonalization (Cao & Naruse, 2019). There is a significant relationship between nurse managers' time pressure and relational coordination based on the effects of exhaustion and depersonalization. When nursing managers experience burnout, they cannot properly meet the needs of their patients, which results in lost productivity and feelings of dissatisfaction (Cao & Naruse, 2019).

To study predictors of occupational well-being in 318 first-line nurse managers a cross-sectional study design was used to examine various relationships between predictors and outcomes. Among other sociodemographic factors, burnout was related to age (Adriaenssens et al., 2017). Thus, the risk of developing burnout was especially acute among women aged 40–50 years old. Furthermore, full-time workers were more likely to suffer burnout than those working part time (Adriaenssens et al., 2017). Additionally, failing to receive the necessary support from co-workers, subordinates and superiors had a strong negative impact on nursing managers and was directly associated with the rejection of their role as a nursing manager (Adriaenssens et al., 2017).

To measure the impact of a series of mindfulness workshops on nurse managers' perception of professional quality of life, burnout, and perceived wellness, a pre/post intervention design was conducted with 13 nurse managers (Ceravolo & Raines, 2019). The intervention was a weekly 60-minute group session led by a mindfulness expert for 8-weeks (Ceravolo & Raines, 2019). Findings showed that establishing productive relationships with other personnel, both within the hospital and elsewhere, and make good use of health and social resources are both considered as risk factors for burnout among nurse managers (Ceravolo & Raines, 2019).

In addition, mindfulness-based interventions can significantly alleviate the degree of burnout experienced by nursing managers (Ceravolo & Raines, 2019). There were significant positive changes in the scores on the compassion satisfaction ($p = .002$) and burnout subscales ($p = .016$) of the Professional Quality of Life scale, and on personal burnout ($p = .023$) and work-related burnout ($p = .029$) on the Copenhagen Burnout Inventory scale, following the mindfulness intervention. The 3-month follow-up scores on compassion satisfaction were higher but not statistically significant ($p = .810$). Scores on the burnout scales, while lower than the preintervention levels, were higher at the 3-month follow-up than immediately following the intervention (Ceravolo & Raines, 2019). Overall, job burnout among nurse leaders can result from various factors. Level of nursing leadership was found to be a burnout influencer with directors demonstrating the least amount of burnout and with clinical nurse managers showing the highest levels of stress and burnout (Kelly et al., 2019). Other factors include constant exposure to an environment of stress (Kelly et al., 2019), work overload (Cao & Naruse, 2019),

and age especially among those aged 40 to 50 years old (Adriaenssens et al., 2017; Cao & Naruse, 2019). Other studies found that working full time (Adriaenssens et al., 2017; Cao & Naruse, 2019), time pressure (Cao & Naruse, 2019), and need for support from coworkers (Adriaenssens et al., 2017) are other types of burnout factors.

BURNOUT OF TRANSFORMATIONAL LEADERS

Studies done in contexts other than nursing investigated the negative impacts of the transformational leadership style on leaders themselves (Arnold et al., 2015). There is empirical evidence that leadership strategies are linked to leaders' own levels of strain (Arnold et al., 2015). Transformational leaders are suggested to use different emotion regulation strategies to meet the demands of this style. Some of these emotion regulation strategies such as adapting and altering the way leaders think, predict resource drain and burnout (Arnold et al., 2015). For leaders, it has been argued that engaging in transformational leadership is a resource drain (Arnold et al., 2015). However, as the relation between transformational leadership and leader strain was negative, results indicate that leaders who highly engage in transformational behaviors would experience less strain.

Other studies found that transformational leadership is an influencing factor for perceived burnout among leaders in the sport field because of the requirements associated with the transformational leadership style (Ugrenovic et al., 2020). A total of 244 ($n = 140$ male, $n = 103$ female, $n = 1$ undisclosed) coaches participated from across all three national collegiate athletic association (NCAA) divisions. The results indicated that there was a significant negative relationship between transformational leadership style and perceived burnout ($r = -.24$, $p = .000$).

Among mental health teams using a prospective non-experimental study design, the relationship between leadership styles and staff burnout including 236 leaders were examined (Corrigan et al., 2002). Results showed that idealized influence, inspirational motivation, and individual consideration dimensions of transformational leadership were significantly negatively associated with the emotional exhaustion dimension of burnout and positively associated with personal accomplishment. Intellectual stimulation was not significantly positively correlated with emotional

exhaustion (Corrigan et al., 2002). One strength about this study that the researcher considered the four components of transformational leadership style including charisma, inspirational motivation, intellectual stimulation, and individualized consideration. This pattern of correlations might suggest that different aspects of transformational leadership have unequal effects on burnout for leaders (Corrigan et al., 2002).

To explore whether transformational, transactional, or passive/avoidance leadership behaviors are prone to burnout, a quantitative non-experimental study design was used. This study examined differences exist between the leader's level of burnout and leadership style of 131 hospitality managers working in Cyprus (Zopiatis & Constanti, 2010). Findings revealed that transformational leadership has a significant positive association with personal accomplishment and is negatively related to emotional exhaustion and depersonalization which are considered as burnout dimensions. This study endorsed that a transformational leader, being highly considerate of employees, provides employees with ability to handle challenging aspects of work and reduces the likelihood of employees experiencing emotional exhaustion. (Zopiatis and Constanti 2010). Whereas among the hospitality managers, transformational leadership style was negatively related to emotional exhaustion and depersonalization as aspects of burnout (Zopiatis & Constanti, 2010).

Transformational leadership is not without some disadvantages especially for leaders themselves. For leaders, engaging in high-demanding transformational leadership was considered as a resource drain which predicts burnout experienced by leaders (Arnold et al., 2015). In the sport field, transformational leadership was negatively associated with transformational leadership, and this is when a leader has poor skills of managing emotions (Ugrenovic et al., 2020). Among mental health teams and among hospitality managers found that transformational leadership is negatively related to emotional exhaustion (Ugrenovic et al., 2020; Zopiatis & Constanti, 2010), negatively related to depersonalization (Zopiatis & Constanti, 2010), and positively associated with personal accomplishment (Ugrenovic et al., 2020; Zopiatis & Constanti, 2010). However, the course of action on how transformational leadership is connected to burnout for each of these studies needs further exploration (Arnold et al., 2015; Corrigan et al., 2002; Ugrenovic et al., 2020; Zopiatis & Constanti, 2010).

DISCUSSION

An extensive review of the literature suggested that transformational leadership is a term that is frequently and consistently used in nursing research. Using transformational leadership helps a leader to transform the organization, resulting in a great benefit to the organization, staff, and the patients (Alloubani et al., 2018; Asif et al., 2019; Lappalainen et al., 2019). Despite its importance and its many benefits on employees, it is not without some disadvantages especially for nurse leaders themselves. This integrative review addresses a clinically serious problem by understanding the effect of transformational leadership style on burnout among nurse leaders, thus, the chances of enacting transformational behaviors while mitigating its negative downsides will get increased. Transformational leadership trainers will consider this style's negative aspects so that leaders will be aware of their own health and wellbeing while transforming and leading the organization. This integrative review investigates a gap of knowledge, which has not been studied, about the effect of leadership on burnout among nurse leaders. The study addresses a change relevant to current modern practice in the form of transformational leadership. Additionally, there is a call to investigate the negative impacts of transformational leadership style for leaders themselves (Bass & Riggio, 2006). Responding to the calls, this integrative review tends to investigate how transformational leadership style might leave nurse leaders prone to burnout. Although some research studies have investigated the relationship between transformational leadership style and burnout in different sectors, research among nurse leaders is limited. This indicates a need for more research in the nursing context.

Burnout has been shown to have negative physical responses in the body resulting from increased demands placed on the individual (Ceravolo & Raines, 2019), which did not contradict the belief that transformational leadership requires extra efforts which is considered in the review as both resource depletion (Arnold et al., 2015) and a cause of emotional depletion (Kelly et al., 2019). This is because of that high-quality leader behaviors are in high need of leaders' resources, which leads to resource depletion, and, consequently, to more strain for leaders. On the one hand, transformational leadership strategies may also influence leaders' own health in the way that high-quality leader behaviors are particularly resource demanding for leaders (Arnold et al., 2015). This result seems to be counterintuitive to the theoretical rationale

that posits that high-demanding transformational leadership behavior leads to more stress experienced by leaders (Arnold et al., 2015).

Among nurse managers, how hard to keep coaching an individual on their performance was considered a source of emotional depletion by one of the leaders (Kelly et al., 2019). Individualized consideration is one of transformational leadership's components which was found to be correlated to burnout among hospitality managers (Zopiatis & Constanti, 2010). Some others considered the challenges a leader encounters when trying to motivate staff as burnout contributors (Kelly et al., 2019). Kelly's et al. (2019) finding does not contradict findings by Corrigan et al. (2002) that one of the transformational leadership components which is inspirational motivation was found to be significantly negatively associated with the emotional exhaustion dimension of burnout.

Other factors that impact nurse leader's burnout were also included in the review. Increased amounts of stress were found to be a leading cause for high rates of burnout, staff and leader turnover, and decreased satisfaction amongst nursing leaders (Kelly et al., 2019). Among many factors that lead to burnout for nurse leaders, having the least amount of experience would lead to burnout more often (Kelly et al., 2019).

Effective ways to prevent burnout among nurse leader were included. To maintain a healthy working environment and prevent burnout among nurse leaders, possible interventions that may be effective could include senior officials lending their support and help to lighten managers' responsibilities, especially those of an administrative nature, for example, by providing more auxiliary staff (Adriaenssens et al., 2017). Effective strategies to reduce negative impacts of transformational nurse leaders need to be investigated.

STRENGTHS AND LIMITATIONS

These published studies helped in giving a detailed analysis and establishing the gaps identified in the topic for this review. Even though an absence of past studies complicates the research process, these studies have shown how leaders react to transformational leadership. The articles that were identified cover different aspects related to nursing and transformational leadership style which have been used in the past. They aid in developing a better understanding of the general concept of transformational leadership and burnout in nursing practice. This review addresses a gap in the literature and offers insight into outcomes of using

transformational leadership style within nursing context.

Although self-report is a generally accepted method used to determine transformational leadership style, a limitation common to most reviewed articles was the potential for self-report bias as nurse leaders' reports were not validated with other resources. Self-report bias is making it difficult to identify the degree to which leaders use transformational leadership. Generalizability of findings are limited due to the use of non-random sampling in most of the studies and the variety of settings, particularly for countries other than the United States. The small sample size in some studies was another factor that limited the generalizability.

Limitations of What the Author Was Able to Do:

Search limiters narrowed the focus of this integrative review so that the information retrieved from the databases was limited according to the values selected. Using more than one limiter decreased the number of the articles in the search results such as the scholarly peer reviewed limits. There were some studies that did not show up in the databases that were used. Additionally, there were some studies that were used in this integrative review though they didn't include appropriate keywords such as "nursing". Articles from contexts other than nursing were included which limited the generalizability of findings to nursing field.

Implications for Practice: The findings from this integrative review can be used by nurse leaders. Nurse leaders can undergo transformational leadership training and mentoring to improve their knowledge and skills in transformational leadership, while mitigating its negative connection with burnout. This will help to nurture individuals who possess the transformational leadership traits. Consequently, those within healthcare organizations can revise selection and promotional strategies for persons hired into leadership positions. They can use transformational leadership subscale to assess for transformational leadership skills and then Copenhagen Burnout Inventory can be used to assess how likely they are to experience burnout even though they are transformational leaders. This is because being transformational leaders is beneficial for the whole organization and at the same time how nurse leaders feel about practicing transformational leadership is also critical for their health and wellbeing. Healthcare organizations need to ensure that their nurse leaders are satisfied with their jobs and show minimal burnout

levels. For this to be achieved, it is essential that these organizations take advantage of the results of this review and ensure that transformational leadership style is employed in their organizations. As discussed, the results of this review suggest that transformational leadership is an effective leadership style within nursing, but it has some negative aspects especially for nurse leaders. This conclusion could have implications for healthcare professionals including nurse leaders and healthcare organizations. Nurse leaders could practice transformational leadership to maintain the magnet status of a hospital while recognizing its stressful downsides.

Future Directions: This integrative review has closed the overall literature gap that existed concerning the association between the transformational leadership style and burnout among nurse leaders. Future research might need to focus on the different management levels that exist among the nurse leaders, because the results may vary significantly. Different levels of management may lead to different results in relation to the topic of this integrative review. Additionally, future research concerning the same topic could continue to provide insightful information on the best transformational leadership training that could be employed to ensure that knowledge is put into action while controlling its potentially negative connection with burnout. Because a leader who is experiencing burnout will not be as effective, training modules are needed that will enable leaders to enact transformational behaviors. In this way even when nurse leaders are experiencing aspects of burnout such as emotional exhaustion or depersonalization, they can still be transformational while reducing the stressfulness of enacting transformational behaviors.

CONCLUSION

This integrative review explored how transformational leadership might be associated with burnout amongst nurse leaders. Research on leadership styles and their relationship with employee's burnout are in existence, but this review extends beyond that and provides information on transformational leadership as an influencing factor of burnout among nurse leaders. Overall, transformational leadership style was established as an effective leadership style at the organizational and employee levels in terms of, for example, job satisfaction and has an association with burnout among leaders. For nurse leaders, it needs to be investigated further.

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Authors & year	Purpose	Design, Sample, settings, country, and measures	Results	Level of evidence
Ugrenovic, L., Shaffer, K., & Boiangin, N. (2020).	T To investigate the relationship between emotional intelligence and burnout as well as leadership styles and burnout in collegiate coaches.	Non-experimental study design. 244 (n = 140 men, n = 103 women, n = 1 undisclosed) From all sports in the National Collegiate Athletic Association (NCAA) divisions Oldenburg Burnout Inventory was used to measure burnout and Multifactor Leadership Questionnaire (MLQ; 2) Leader Form (5x-Short) version was used to evaluate three different leadership styles (transformational, transactional, and passive-avoidant).	Strong leadership characteristics as well as emotional intelligence (EI) in collegiate coaches help prevent burnout symptoms. Significant moderate negative relationship between EI and perceived burnout (p = .000). Significant negative relationship between transformational leadership style and perceived burnout (p = .000). Significant positive relationship between passive-avoidant leadership style and perceived burnout (p = .000). Coaches who are passive-avoidant leaders are more likely to experience burnout despite their high EI.	Level III B
Corrigan, P.W., Diwan, S., Campion, J., & Rashid, F. (2002).	Examined the relationship between leadership styles and staff burnout including leaders in mental health services teams.	Prospective Non-experimental study design. 236 leaders and 620 subordinates from 54 mental health teams in state hospitals and community mental health programs First, The Multifactor Leadership Questionnaire to measure leadership styles. Maslach Burnout Inventory with 22-items was used to measure burnout.	Transformational leadership to be positively associated with a cohesive organizational culture and negatively associated with burnout. Moreover, leaders and subordinates differ in their ratings of transformational leadership and leaders viewed themselves more positively.	Level III B
Arnold, K. A., Connelly, C. E., Walsh, M. M., & Martin Ginis, K. A. (2015).	This study investigated the potential impact of leadership style on	Non-experimental study design. 205 leaders from a wide range of industries participated in the study including	Transformational leadership exerted a significant indirect effect on burnout through emotional	Level III B

	leaders' emotional regulation strategies and burnout.	manufacturing, business services/consulting, construction, information technology, financial, wholesale, sales/retail, engineering, education, and various smaller groups. People were recruited from different countries through a nonprofit organization those countries include North America, China, India, Australia, Hong Kong, Malaysia, and Puerto Rico. Measures: leadership dimensions were measured using the Multifactor Leadership Questionnaire. Seven items from the Copenhagen Burnout Inventory was used to measure work burnout.	regulation strategies such as genuine emotion which acts as a mediator (point estimate -.04; CI: -.09 to -.01).	
Zopiatis, A., & Constanti, P. (2010).	The primary purpose of their paper was to investigate the association between leadership styles and burnout among hospitality managers currently working in the industry of Cyprus.	A quantitative non-experimental study design was used. questionnaires were administered to 131 hospitality managers in Cyprus using simple random sampling. The reliability and factorial validity of Maslach's burnout inventory (MBI) and the multifactor leadership questionnaire (MLQ 5X-Short) have been confirmed.	Transformational leadership has a significant positive association with personal accomplishment and is negatively related to emotional exhaustion and depersonalization. A positive relationship exists between passive avoidance leadership and emotional exhaustion and depersonalization. Finally, individuals with a passive avoidance leadership style exhibited higher levels of burnout.	Level III B
Kelly, L. A., Lefton, C., & Fischer, S. A. (2019).	To examine and report burnout, secondary trauma, and compassion satisfaction in acute care nurse leaders of	672 leaders participated in the survey. Large mixed methods study which consisted of quantitative survey	There was no difference between the groups in terms of burnout and secondary traumatic stress, however a post	Level III B

	different hierarchies, and to explore how these leaders recognize compassion fatigue and promote compassion satisfaction.	measuring and qualitative data. From the 2 hospitals selected for the qualitative component, 16 nurse leaders consisted of 6 CMs, 6 SCMs, and 4 directors were included. USA. Nothing was mentioned regarding how the rigorous the interview data was. The type of sampling was missing. 29 hospitals were included in the quantitative data collection and Six hundred seventy-two nurse leaders participated in the study. Measures: The Professional Quality of Life (ProQOL) ² scale was used to measure burnout.	hoc analysis did show a higher rate in compassion satisfaction amongst the director group. Overall satisfaction increased with each level of leadership. Through regression modeling, it was shown that there as higher burnout in nurse leaders with the lowest experience. Furthermore, it was seen that if nurse leaders had higher work life balance and overall satisfaction, they showed significantly less burnout. It was also shown that lower collaboration predicted higher levels of burnout. The correlations between satisfaction questions and compassion satisfaction ranged from 0.400 to 0.583, and the multicollinearity diagnostics did not show variance inflation values higher than 2.05. Qualitative findings demonstrated that emotional drain was very common and likely to accumulate, leading to compassion fatigue.	
Cao, X., & Naruse, T. (2019).	To examine the main effects of time pressure and relational coordination with nursing managers on burnout and to further analyze the moderating role of relational coordination with nursing managers on the association	Cross-sectional, quantitative study design 93 home-visiting nurses in Japan. Instruments include the Japanese Burnout Inventory (J-BI) to measure burnout.	Time pressure is positive predictor for emotional exhaustion and depersonalization. Nurse managers' relational coordination is negatively related to depersonalization. There is a significant relationship between nurse manager' time	Level III B

	between time pressure and burnout among home-visiting nurses in Japan.		pressure and relational coordination based on the effects of exhaustion and depersonalization. Time pressure was a positive contributor to exhaustion and depersonalization when the home-visiting nurses reported low relational coordination with the nursing managers.	
Ceravolo, D., & Raines, D. A. (2019).	To measure the impact of a series of mindfulness workshops on nurse managers' perception of professional quality of life, burnout, and perceived wellness.	A pre/post intervention design with three data collection points: prior to, at the conclusion of, and at 3 months following the intervention. 13 nurse managers in Jordan between the two campuses at Sisters of Charity Hospital, an acute care hospital. The intervention was a weekly 60-minute group session lead by a mindfulness expert for 8-weeks and were based on the principles and exercises of Mindfulness-Based Stress Reduction (Kabat-Zinn, 2003). To measure burnout the CBI consists of 19 items with three subscales focused on personal, work-related, and client-related burnout.	There were significant changes in the scores on the compassion satisfaction ($p = .002$) and burnout subscales ($p = .016$) of the Professional Quality of Life scale, and on personal burnout ($p = .023$) and work-related burnout ($p = .029$) on the Copenhagen Burnout Inventory scale, following the mindfulness intervention. The 3-month follow-up scores on compassion satisfaction were higher but not statistically significant ($p = .810$). Scores on the burnout scales, while lower than the preintervention levels, were higher at the 3-month follow-up than immediately following the intervention.	Level II A
Adriaenssens, J., Hamelink, A., & Van Bogaert, P. (2017).	To analyze and describe relationships between job characteristics, and interdisciplinary conflicts with physicians as potential predictors	a cross-sectional design and used a web-based survey. in 11 Belgian (Flemish) hospitals. 318 first ling managers To measure burnout of nurse managers,	job demand and job control measures were predictive of all outcomes. Collaboration with doctors only predicted job satisfaction and turnover intention.	Level III B

	of occupational well-being (job satisfaction, psychosomatic distress, turnover intention, work engagement and burnout) among first ling managers.	Burnout (MBI-HSS) scale	Social support from management was predictive of turnover intention. Social support from colleague- first-line nurse managers was not predictive. Social support from the staff members (team) was however a strong predictor of all stress outcomes.	
Alloubani, A., Akhu-Zaheya, L., Abdelhafiz, I. M., & Almatari, M. (2019).	To investigate managers' leadership styles, from the perspective of registered nurses, and its effects on the quality of nursing care in both the private and public healthcare sectors	A cross-sectional, descriptive. 3 private hospitals & 3 public hospitals/ 400 in Jordan Transformational leadership, transactional leadership (TAL), laissez-faire leadership. MLQ 5X	The participants in the private hospitals prefer transformational style more than public hospital the mean and SD (2.97, 0.54), (1.37, 0.54), t= 38.6, p< 0,001. For the transactional leadership, the mean and SD were (2.10, 0.60), (3.14, 0.49) for the private and public hospital, which was significant (p< = < 0.001), this would indicate that participants in the public hospital prefer the TAL style. For the laissez-faire leadership style, the mean and SD were (1.19, 0.93), (1.23,0.83) for the private and public hospital. The patient's perception of quality of nursing care revealed a significant difference between private and public hospitals (p<0.001). All transformational Leadership subscales were significantly positively correlated with effectiveness, extra effort, satisfaction, and the quality of nursing care. The overall TAL	Level III B

			was found to have a significant negative correlation with effectiveness , extra effort, satisfaction, and quality of care	
Lappalainen, M., Härkänen, M., & Kvist, T. (2020).	To describe medication safety, transformational leader and their relationship	Cross sectional. central hospital/161 Finland The Finland version of Transformational Leadership Scale (TLS) which was developed at the University of Eastern Finland and has four subscales for nurse managers: giving feedback and rewarding (six items), ethical leadership (14 items), support to professional development (seven items) and management of the nursing process (16 items).	Nurses evaluated medication safety and transformational leadership in their units was excellent and good, respectively. There was a moderate but statistically significant correlation between Transformational leadership and medication safety. The medication competence of nurses and the management of nursing processes were significantly related to medication safety.	Level III B
Asif, M., Jameel, A., Hussain, A., Hwang, J., & Sahito, N. (2019).	To examine relationship between transformational leadership. Structural empowerment, nurse assessed adverse patient outcomes, and quality of care	Cross-sectional study. 17 government hospital/ 600. Pakistan Transformational leadership.7 item scale developed by Carless et al.	Correlation among TL, SE, JS, and QOC are positive & significant, but the correlation of TL, SE, JS and QOC with APO are significant negative. TL is positively related to nurses' JS (p < 0.01). TL is positively related to SE (p < 0.01), SE is positively related to nurse assessed QOC (p < 0.01), JS is positively related to nurse assessed QOC (p<0.01). SE negatively related to APO & a negative association between SE and APO (p < 0.01). nurses' JS is negatively related to APO (p < 0.01)	Level III B

Table 1. Summary of the findings of studies included in the present integrative review



Application of Nanotechnology for Development of Latent Lip Prints: A Review

ANNU SAINI¹, CHITRANG DIXIT^{*1}, URVASHI DIXIT², ROHIT AWANA²

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The forensic science is the scientific approach to identify these existing identities. From the beginning of the civilization, identification of a person uses to be an integral part of various legal and cultural activities. Forensic science is used not only to identify the criminal but also to solve the hidden mysteries of the past. With the modernization of the society, the need of personal identification also became an integral part of forensic sciences, weather its recording fingerprints for biometric attendance or dental records for estimation of age.

KEYWORDS: Nanotechnology, Lip Prints, Chelipscopy

INTRODUCTION

"Existence is Identity, Consciousness is Identification." - Ayn Rand

Since ancient times, the presence of a person at the crime scene used to be predicted by the fingerprints found at the crime scene.¹⁻⁷ Collection of fingerprints became the prerequisite of any forensic investigation. The fingerprint powder will fix to the residues left by the finger and give rise to the distinctive patterns that help to identify an individual. Latent fingerprints are commonly developed by various colored materials.⁷⁻¹¹

In the era of nanotechnology, different nanomaterials are utilized to develop latent fingerprints. Nanomaterials like CdSe, ZnO, TiO, Gold nanoparticles are used to develop latent fingerprints on porous as well as non-porous surfaces.¹³⁻¹⁷

Unlike fingerprints and DNA fingerprints, lip-prints are also unique identification tool and does not change during the entire lifespan of a person.^{6-8,11,12} Use of lip prints in forensic sciences for personal identification is of paramount importance in judicial settings and court proceedings.^{6,7,11}

CHEILOSCOPY

Lip prints are normal lines and fissures in the forms of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin, examination of which is known as cheiloscopsy.⁶⁻¹⁰ It deals with examination of system of furrows on the red part of human lips. The creases on

the vermilion border of the lips, which appear as white areas in lip prints, and the raised reddish areas outlined by these creases, which appear as dark areas, are analogous to the furrows and ridges of friction ridge skin. The creases on the vermilion border are also referred to as grooves, furrows, wrinkles and valleys.

Lip prints are unique and do not change during the life of a person. It has been verified that they recover after undergoing alterations like trauma, inflammation and diseases like herpes and that the disposition and form of the furrows does not vary with environmental factors. The lip prints of parents and children and those of siblings have shown some similarities. It has also been suggested that variations in patterns among males and females could help in sex determination.

COMPOSITION OF FINGERPRINTS AND LIP PRINT

The composition of fingerprints consists Sebaceous, Eccrine, Apocrine glands secretions which contains organic (Glycerides, Fatty acids, Wax ester, Squalene, Sterol esters, Sterols, Amino acids, Proteins, Urea, Uric acid, Lactic acid, Sugars, Creatinine, Choline, Carbohydrates) as well as inorganic (Chlorides, Metal ions, Sulfates, Phosphates, Ammonia, Water, Iron) salts. The most common technique for latent fingerprint detection is the powder method, in which powdered materials are applied in the crime scene vicinity and it is adsorbed on the sweat residue, secretions and eccrine (98% water + 20% moisture) on the fingers to obtain fingerprints. Similarly, the powder



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applied on the latent lip prints can be detected due to presence of organic (Peptides, histatins, cystatins, statherin, sialin, cathelicidin, defensin, growth factors, non-enzymatic proteins include mucins, lactoferrins, proline-rich proteins (PRPs), calprotectin, interferon, albumins and globulins) and inorganic salts (potassium, sodium, calcium, magnesium and ammonium cations. The anionic group is composed of phosphates, carbonates, chlorides, rhodium and a number of micronutrients).

NANOTECHNOLOGY FOR DEVELOPMENT OF LATENT FINGERPRINTS

Nanotechnology have wide variety of application in different fields like medicine, engineering, electrical etc. Nanotechnology is an advanced science, and due to its advantages in various fields, it is referred to as a universal purpose technology since it has its impact on relatively on all fields, industries and all areas of civilization.

Nano-forensics, a completely new area of forensic science, nanotechnology is beginning to have an impact on the handling of evidence at crime scenes, its analysis in the laboratory and its presentation in the court room. Application of nanotechnology is likely to enhance the capacity of toxic materials, forensic evidence in tissue, materials and soil.

The application of nanomaterial for the development of latent prints is likely to become a breakthrough in the world of forensic sciences. In a study titled Rare Earth Fluorescent Nanomaterials for Enhanced Development of Latent Fingerprints Meng Wang Ming Li developed latent finger prints by using rare earth materials europium oxide, yttrium oxide, lanthanum oxide. In another study conducted by Divya V and colleagues proved that the fluorescent and amphiphilic silica nano powder is very efficient for developing latent fingerprints on various surfaces under illumination with 365 nm wavelength UV light. Chavez et al. demonstrated the developed finger prints on Low Contrast Surfaces using Phosphorescent Nanomaterials. Zhaolei Wang, Xue Jiang developed latent fingerprints by utilizing hydrophilic $\text{Fe}_3\text{O}_4@\text{SiO}_2\text{-CdTe}$ nanoparticles the results confirmed that the bifunctional NPs have good magnetic and strong fluorescent properties favorable for their application in the detection of latent fingerprints.

These nanosized particles, when used as a developmental method in the latent fingerprinting,

reflect numerous advantages over conventional methods. These particles can easily be employed to reveal fingerprints on various surfaces and has excellent potential for envisioning of finger ridge detailing in a more precise way. This reflects the better discernibility of nanoparticles over commercially available conventional materials used for fingerprinting.

APPLICATION OF NANOMATERIALS FOR THE DEVELOPMENT OF LIP PRINTS

Recently most of the studies on lip prints are basically focused on gender determination and correlation with blood group or prevalence-based studies. Lip prints as an adjuvant forensic tool has a great potential in the field of forensic sciences. The studies based on different method of development of latent lip print should be of prime concern. Previous studies use material like sudan III, magnetic black powder and lipstick marks from lip prints to develop lip prints. In the present era of nanotechnology, nanomaterials like metal oxide nanoparticles, gold nanoparticles, silver nanoparticle etc. can be used for better results.

In a study conducted by Suresh C et al. titled "Facile LaOF: Sm_3^+ based labeling agent and their applications in residue chemistry of latent fingerprint and cheiloscropy under UV-visible light indicated the utility of LaOF: Sm_3^+ (5 mol%) NPs in visualization of LFPs, lips print as well as useful component in solid state lighting applications.

The application of nanomaterial for the development of lip prints is likely to become a breakthrough in the world of forensic sciences. In future other nanomaterials can be used to develop and analyze latent lip prints.

CONCLUSION

The lip-print detection method is crucial in providing evidence for crime investigations which can be presented in court. Nanotechnology is therefore developing in forensic research to effortlessly acquire evidence at crime scenes and their surroundings and present this after laboratory analysis in a court of law. The growing demand of nanotechnology today has enabled most of the scientist and analyst to go in the efficient strategic objectives and sound skills in the field of nanotechnology. Additionally, further studies using different nanoparticles on different population group can facilitate the development of multiple regression models that could possibly enhance human identification.

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The Psychological Impact of the Second Wave of COVID-19 on People Living with Type-2 Diabetes Mellitus

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BACKGROUND: COVID-19 pandemic has led to an increase in various psychological problems for people in India.

AIM: The aim of this research was to assess the psychological impact of COVID-19 on people living with Type 2 Diabetes Mellitus evaluating their stress, anxiety, and depression levels during pandemic.

MATERIALS AND METHOD: The study used validated Hindi version of GASS-21 questionnaire, It was handed out to 1143 eligible and consenting patients across eight secondary care centres in Lucknow.

RESULTS: The study enrolled 1143 participants and out of that, 8% were depressed, 19% were anxious, and 6% were stressed. The significant psychological drivers were family members who tested positive for COVID 19, death of a first degree family member, post covid infections and vaccination status. Patients who were not vaccinated for COVID were significantly more affected psychologically.

CONCLUSION: COVID-19 and associated morbidity and mortality, post covid complications and vaccinations on apprehensions were significantly associated COVID-19 related psychological impacts that were studied.

KEYWORDS: Psychological Impact, Diabetes, COVID-19, DASS-21, Stress, Anxiety, Depression

INTRODUCTION

COVID-19 pandemic being a multi-dimensional stressor, led to an increase in many psychological problems for people. Studies suggest that more than two-fifths of the population experienced mental disorders due to lockdown and the prevailing COVID-19 pandemic, which most commonly include stress, anxiety, and depression.¹ Stress is an emotional strain or pressure that might be triggered by any physical or psychological factor and may lead to disturbance in homeostasis. On the other hand, anxiety is the fear of the unknown, which is the body's natural response to stress. Depression is the constant state of disinterest in daily chores and activities.²

In a pandemic situation, with a lack of substantive cure, emerging variants and sub-variants of the virus, a plethora of fake news via social media, future uncertainties regarding livelihood, and overwhelming media-created fear psychosis, people became more susceptible to anxiety, depression, and stress.³ Any stress caused to the body, mental or physical, has been shown to have significant effects on the individual's metabolism. Hence, it is even more evident in patients with chronic medical conditions and comorbidities. A

potential impact of stress is chronic hyperglycaemia in Type 2 diabetes mellitus.⁴ Globally, Type 2 Diabetes Mellitus has been identified as a significant risk factor for increased morbidity and mortality in the COVID-19 study. Patients with severe COVID-19 and diabetes were significantly more likely to require ventilator support and admission in the ICU and had higher mortality than those with severe COVID-19 without Diabetes.⁵ Our own study done earlier revealed that lockdown during Covid 19 lead to more stress and change in dietary and sleep pattern.⁶

This study assessed the mental health of people living with diabetes during the second wave of COVID-19 using the DASS-21 scale. The DASS-21 scale, a 21-item version of the Depression Anxiety Stress Scale, can be easily administered to people with diabetes. Furthermore, its clinical ease of use and ability to produce comparative data on a real-time basis has been commended.⁷ Its validation in Hindi, the language commonly spoken and understood in North India, was the reason for its choice.⁸ The study's objective is to gauge the mental impact of the pandemic on people living with diabetes and the probable factors



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contributing to them.

MATERIALS AND METHOD

Study Design: It was a multicentre, qualitative, cross-sectional study involving people living with diabetes mellitus conducted at eight participating secondary diabetes care centres in the geographic bounds of the city of Lucknow, Uttar Pradesh, India.

Inclusion/Exclusion Criteria:

Inclusion Criteria was

- People with Type 2 diabetes mellitus over the age of 18
- Patients taking either Insulin injections or oral medications or both
- Patients with history of Type 2 DM for more than six months
- Patients willing to accept and sign informed consent before data collection.

Exclusion Criteria was

- Illiterate people
- People unable to understand and comply with instructions
- Patients unable to perform self-care, self-administer medications, or have poor cognitive functions.
- Patients with severe or life-threatening systemic abnormalities (organ failure, ICU ridden, trauma)
- Hospitalized patients

To elicit responses from all enrolled patients, study proforma was used and was then digitized by a trained medical assistant.

Research Instruments: DASS-21 questionnaire was the research instrument of choice for this study. The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety, and stress. Each of the three DASS-21 scales contains seven items, divided into subscales with similar content. DASS-21's psychometric properties were deemed commendable. It is reliable, valid, and easy to use. The Depression Anxiety Stress Scale (DASS) developed by Lovibond and Lovibond is one of the instruments commonly used to assess subjective depression and anxiety in patients.⁹ Our study used a validated Hindi version of the DASS questionnaire.¹⁰ DASS is a quantitative measure of distress based on the three dimensions of depression, anxiety, and stress. It is not a diagnostic indicator. Inherently, emotional syndromes like depression and anxiety vary along a continuum of severity (regardless of the diagnosis).

Therefore, selecting a single cut-off score as a measure of clinical severity is necessarily arbitrary (Table 1).

	Depressio n	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

Table 1. Calculation system/ Scoring System of the DASS-21 Questionnaire

Demographic data, data related to diabetes duration and control, comorbidities associated with diabetes, the financial status of the family, and illness related to COVID-19 were captured in case record form (CRF). The CRF was created specifically for this study and was explained well to the patients during data collection (Figure 1).

1. TEST FOR COVID DONE: Yes ☐ No ☐

2. IF Yes- Which Were Positive

a. RTPCR, ☐

b. HRCT Lungs, ☐

c. Antigen test, ☐

3. If No- Were you Suspected of Covid

a. Yes ☐

b. No ☐

4. If Diagnosed/Suspected Covid

a. Place of treatment

i. Hospital ☐

ii. Domiciliary ☐

b. Oxygen requirement. Yes ☐ No ☐

c. Need for assisted respiratory support (bipap/ventilator). Yes ☐ No ☐

d. Inflammatory markers raised. Yes ☐ No ☐

e. Duration of treatment

i. <14 days ☐

ii. >14 days ☐

5. Vaccination Status:

a. None ☐

b. single dose ☐

c. double dose ☐

6. If Vaccinated - Type of Vaccine

a. Covishield ☐

b. Covaxin ☐

c. others ☐

7. If not vaccinated state reason

a. Non availability ☐

b. Apprehension of harm ☐

c. Allergy ☐

d. Confusion about dosing ☐

e. Doubts about vaccination ☐

f. Fear of needle ☐

g. Not well versed with registration process ☐

h. Not falling in guidelines ☐

8. Were you worried about

a. Non availability of beds. Y ☐ N ☐

b. Non availability of oxygen. Y ☐ N ☐

c. Younger people getting affected Y ☐ N ☐

d. Non availability of the doctors. Y ☐ N ☐

e. Post covid Black/yellow/white fungus. Y ☐ N ☐

9. Were you Following news through social media/newspapers/electronic media. Y ☐ N ☐

10. H/O Member of family/ close acquaintance tested positive for covid. Y ☐ N ☐

11. Whether you Lost earning more than 50%. Y ☐ N ☐

12. H/O Death

a. First degree relative ☐

b. In family ☐

c. Close acquaintance ☐

13. Use of any medication in last three months to overcome stress. Y ☐ N ☐

Figure 1. The Case Record Form (CRF)

Methodology: The patients were screened from the eight participating secondary diabetes care centres and were shortlisted according to the eligibility criteria. Once they had signed the written consent form, data was collected in the case record form (CRF), followed by providing the DASS-21 questionnaire to patients to collect their responses.

Sampling Sizes and Bias: The sample size was 1143 over a timeframe of (MM) in 8 participating tertiary care centres. As far as geographic representation was concerned, the centres were well distributed all over the study.

Statistical Methods: Statistical analysis was performed using SPSS statistics windows version 18. Categorical data were represented in proportions, and continuous data were defined as mean and standard deviation. Statistical significances were tested using a t-test for means and proportions at 1% and 5% significance levels.

RESULTS

1143 subjects were recruited from at 8 study sites immediately after the second COVID 19 wave. Table 2 highlights the demographic profile of the patients participating in the survey. The mean age of patients was 53.9 years, the total number of female patients was 519, and male patients were 625. The mean BMI came out to be 26.79 kg/m² and the average duration of the diabetes was 6.23 years. The comorbid conditions that were analysed included hypertension (487), Obesity (211), Hypothyroidism (175), and Psychiatric Illness (88). Table 2 highlights the contribution of each site [Table 2 (a) & (b)].

For this study, Mild, Moderate, Severe, and Extremely Severe classifications of Depression, Anxiety, and Stress in the DASS21 questionnaire were clubbed together as Depressed, Anxious, and Stressed, respectively. Based on the category, of all patients, 8% were Depressed, 19% were Anxious, and 6% were stressed as per the DASS-21 scoring system [Figure 2(a)].

Figure 2 (b) highlights the further break-up of Depression, Anxiety, and Stress as per the DASS21 questionnaire. Significantly few patients reported Severe or Extremely Severe on the three parameters.

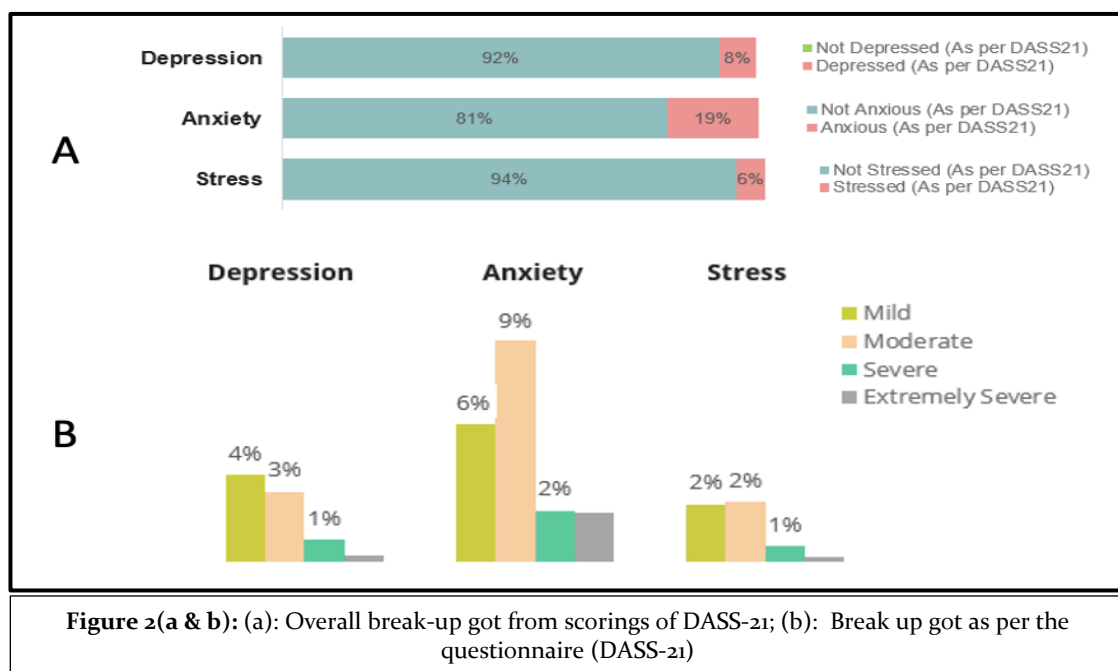
Out of the various aspects of stress-inducing COVID-related parameters that were measured in the CRF, the most crucial COVID-19-related drivers of psychological

DEMOGRAPHICS		
Gender		n = 1144
	Male	54.6% (625)
	Female	45.4% (519)
Age		n = 1125
	Average Age	53.9 Years
	SD	11.3
	95% lower CI for Mean	53.2
	95% upper CI for Mean	54.6
BMI		n = 1107
	Average - BMI	26.79
	SD	5.1
	95% lower CI for Mean	26.5
	95% upper CI for Mean	27.1
Duration of Diabetics		n = 788
	<1 years	1.3% (10)
	1-5 years	39.9% (314)
	5-10 years	34.5% (272)
	>10 years	24.4% (192)
	Average Duration	6.23 Years
Comorbid conditions		n = 1130
	Hypertension	43.1% (487)
	Obesity	18.7% (211)
	Hypothyroidism	15.5% (175)
	Psychiatric illness	7.8% (88)

Table 2 (a). Demographic data of participants

Site	No. of Participants Enrolled
Site 1	37
Site 2	131
Site 3	236
Site 4	131
Site 5	276
Site 6	224
Site 7	15
Site 8	95

Table 2 (b). Contribution from each site of participants



impact were Family members (who tested positive for COVID), first-degree family member's death because of COVID, and Post COVID infections [Figure 3(a), (b) & (c)].

Vaccination Status is another critical driver of the psychological impact of COVID-19. Patients who were not vaccinated were significantly more affected psychologically. 50% (180 patients) out of 371 patients who were not vaccinated yet, the reasons for not getting vaccinated included doubts about vaccination (n=180), non-availability (n=94), confusion about dosing (n=42), not well versed with the registration process (n=20) and apprehension of harm (n=17) 25%. (94 patients) did not get vaccinated because of the non-availability of dosages. Only a few patients, 4% (17 patients), were concerned about potential harm from vaccination.

DISCUSSION

People with diabetes are at a higher risk of developing depression, almost 24% more than those without diabetes.¹¹ This has been discussed in studies where depression has been found to be responsible for poor glycaemic index control, increasing the risk of diabetes-related complications and comorbidities.¹¹ While stress directly affects the blood glucose level or indirectly impacts a patient's ability to maintain a healthy regime, disrupting their adherence to diet and treatment.^{13,14} Khuwaja et al.¹⁵ reported that anxiety and depression are common among diabetic patients in Pakistan. However, in the indexed study, it has been reported

that the prevalence of psychological disorders in type 2 diabetic patients, depression, anxiety, and stress are only 8%, 19%, and 6%, respectively. Studies also show that developed countries had almost double the number of people with similar conditions.¹⁶

The conducted index study's results focus on the factors that cause distress among people with diabetes. The news of post-covid fungal infection did have significant impact on people living with diabetes in causing anxiety. Additionally in people with T2 diabetes stress and depression significantly correlated to their families testing positive or the demise of any first-degree relative. Depression, contradicting the above studies, didn't show any specific significant correlation.

In the study by Joaquim et al.¹⁷, they concluded that losing any family member/friend amplifies psychological distress, especially in patients with existing mental conditions or comorbidities.

Palgi et al.¹⁸ demonstrated that hesitancy toward the COVID-19 vaccinations among the population was one of the most significant driving factors for stress, anxiety, and depression among Israelis. Vaccination status also played an essential driver of psychological distress in our study, where higher levels of vaccine hesitancy could double the risk of depression in patients.

The study conducted had certain limiting factors. It included only people with type 2 diabetes mellitus attending secondary diabetes care centres and, possible



Figure 3(a, b & c): (a): COVID-19 related Drivers of Depression with p-values; (b): COVID-19 related Drivers of Anxiety with p-values; (c): COVID-19 related Drivers of Stress with p-values

recall bias for the CRF was administered on the first post-covid visit. Second, since the number of factors triggering psychological distress is innumerable, there could be many factors other than those considered in this exploratory study. Third, the break-up of patients into depressed, anxious, and stressed was entirely done as per the scoring of the DASS questionnaire, which is a screening and not a diagnostic tool.

CONCLUSION

The index study highlights the factors which were associated with increased risk of depression, anxiety and stress in people living with diabetes during second wave of Covid-19. Covid-19 and associated morbidity and mortality, post covid complications, and vaccination apprehensions were significantly associated Covid-19 related psychological impacts

studied. The study also highlights the importance of evaluating factors related to psychological stressors in high-risk populations like people with diabetes and preparing patients for stressors like the COVID-19 pandemic in a country like India, where mental health facilities are nascent.

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