NATIONAL JOURNAL OF MEDICAL AND ALLIED SCIENCES

Volume 12, Issue 2, Pages 1-28, July - December 2023

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National Journal of Medical and Allied Sciences

[ISSN Online: 2319 – 6335, Print: 2393 – 9192|Editorial |Open Access]

Website:-www.njmsonline.org

GLOBAL PERSPECTIVES ON TRAUMATIC BRAIN INJURY: PREVENTION, MANAGEMENT, AND POLICY RECOMMENDATIONS

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Traumatic Brain Injury (TBI) remains a significant global public health challenge, with the burden of disability and death steadily rising across regions [1]. Annually, approximately 69 million individuals (95% CI: 64–74 million) suffer from TBI of all causes, with the highest incidences observed in Southeast Asia and the Western Pacific [2]. Globally, falls were the leading cause of TBI in 2021, followed by road injuries, interpersonal violence, and exposure to mechanical forces. Head injuries resulting from road traffic collisions are especially prevalent, and the proportion of TBIs attributable to such incidents is markedly higher in low- and middle-income countries [3, 4].

In high-income nations, the incidence of TBI due to road traffic accidents has decreased, attributable to effective preventive measures such as legislation, improved infrastructure, vehicle safety standards, and helmet use [5]. The United Nations Decade of Action for Road Safety (2011–2020) sought to halve traffic-related deaths—currently estimated at around 1.3 million—by implementing comprehensive strategies including road safety management, safer vehicles, informed road user behavior, and enhanced post-crash response systems [6]. Achieving these ambitious targets necessitates heightened awareness among policymakers and the public to support effective prevention programs and improve patient care.

Accurate epidemiological data are essential for designing targeted interventions; such information underpins the development and deployment of strategies aimed at reducing TBI incidence and severity [7]. Vulnerable populations, especially children and adolescents, are at heightened risk, often experiencing concussions or mild TBIs that can have enduring effects on cognition, language, learning, behavior, and emotional health . While most recover fully within days or weeks, a subset may develop prolonged or severe symptoms [8].

Despite advances, misconceptions about TBI persist among healthcare providers, which can impede optimal care. Addressing the global TBI burden requires a comprehensive approach that includes strengthening prevention strategies, enhancing clinical management, and raising awareness among healthcare professionals and the public.

To effectively combat the global TBI burden, the following actions are essential:

1. Strengthen Data Systems: Develop comprehensive, standardized surveillance systems worldwide to

monitor TBI incidence, causes, and outcomes, facilitating informed decision-making.

2. Enhance Prevention Strategies: Enforce and promote road safety laws, increase helmet and seatbelt use, and implement fall prevention programs, especially targeting vulnerable groups like children and the elderly.

3. Increase Public Awareness: Launch educational campaigns to dispel myths about TBI, emphasizing prevention, early detection, and timely treatment.

4. Improve Healthcare Capacity: Train healthcare providers in best practices for diagnosis, management, and rehabilitation of TBI patients across all settings.

5. Expand Access to Care: Invest in trauma and rehabilitation services, particularly in low-resource settings, to ensure prompt and effective treatment.

6. Support Research and Innovation: Promote research to develop improved diagnostic tools, treatments, and prevention methods tailored to various settings.

7. Foster Multisectoral Collaboration: Encourage partnerships among governments, health agencies, communities, and international organizations to coordinate and sustain TBI prevention and care initiatives.

Implementing these recommendations can lead to significant reductions in TBI-related morbidity and mortality, ultimately saving lives and improving outcomes for millions worldwide.

References:

1. Congress on mild traumatic brain injury in the United States: steps to prevent a serious public health problem. Atlanta, GA: CDC; 2003.
2. Dewan MC, Rattani A, Gupta S, et al. Estimating the global incidence of traumatic brain injury. J Neurosurg. 2018;130(4):1080–1097.
3. Roozenbeek B, Maas AI, Menon DK. Changing patterns in the epidemiology of traumatic brain injury. Nat Rev Neurol. 2013;9(4):231–236.
4. Zhong H, Feng Y, Shen J, Rao T, Dai H, Zhong W, G, Zhao G. Global burden of traumatic brain injury in 204 countries and territories from 1990 to 2021. Am J Prev Med. 2025;68(4):754–763.
5. Faul M, Xu L, Wald MM, et al. Traumatic brain injury in the United States: emergency department visits, hospitalizations, and deaths, 2002–2006. Atlanta, GA: CDC; 2010.
6. Indian Ministry of Home Affairs. Accidental deaths and suicides in India. New Delhi: National Crime Records Bureau; 2014.
7. Gurusamy J, Gandhi S, Amudhan S, et al. Misconceptions about traumatic brain injury among nursing students in India: implications for nursing care and curriculum. BMC Nurs. 2019;18:64.
8. Wilson L, Dams-O'Connor K. Traumatic brain injury in children and adolescents. Pediatr Clin. 2019;66(4):635–651.

Conflicts of Interest: Nil Source of Funding: Nil

Citation: Mahmood SE. Global Perspectives on Traumatic Brain Injury: Prevention, Management, and Policy Recommendations. National Journal of Medical and Allied Sciences 2023; 12(2): 1-2

Date of Submission: 03-07-2023
Date of Acceptance: 20-07-2023

National Journal of Medical and Allied Sciences

[ISSN Online: 2319 – 6335, Print: 2393 – 9192|Review article |Open Access]

Website:-www.njmsonline.org

ENSURING THE RIGHT TO HEALTH OF VULNERABLE GROUPS: AN ANALYSIS OF INDIA'S CONSTITUTIONAL FRAMEWORK

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ABSTRACT

The right to health is an essential component of human well-being and is intricately connected to the realisation of other fundamental rights. This paper analyses the constitutional framework in India, focusing on the protection of the right to health for vulnerable groups such as women, children, workers, persons with disabilities, and individuals with HIV/AIDS. It examines key constitutional provisions, including Article 21, which guarantees the right to life and has been judicially interpreted to encompass the right to health. The analysis also highlights significant judicial precedents that have expanded the scope of health rights, underscoring the State's obligation to safeguard these rights for Vulnerable groups. Despite these advancements, the analysis identifies gaps in legislative measures and challenges in implementation that hinder equitable access to healthcare. It concludes by suggesting recommendations to strengthen constitutional protections, address implementation barriers, and align India's health governance with the Sustainable Development Goal of ensuring health and well-being for all.

Keywords: Right to Health, Vulnerable Groups, Sustainable Development, Constitutional Framework, Fundamental Rights

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INTRODUCTION

The 2030 Agenda for Sustainable Development emphasizes the transformative principle of "Leaving No One Behind," which necessitates focused efforts to address the needs of populations characterised by heightened vulnerability to poor health and restricted healthcare access [1].These vulnerable groups face substantial disparities in life expectancy and healthcare availability and its utilisation, along with elevated health challenges, including morbidity and mortality. In this context, specific populations, such as women, children, workers, persons with disabilities, and individuals living with HIV/AIDS, often struggle to have their right to health adequately protected [2].

Vulnerability in health signifies a heightened susceptibility to adverse health outcomes arising from various factors, including age, gender, socioeconomic status, or specific health conditions. It is often a consequence of systemic inequalities that limit access to essential healthcare services and determinants of health, such as clean water, adequate nutrition, and safe living conditions. In the Indian context, vulnerable groups face a unique set of challenges [3]. Women, for instance, encounter gender-based discrimination that restricts their access to healthcare, while children are often at risk due to inadequate nutrition and healthcare facilities. Workers may face occupational health hazards without adequate safeguards, and persons with disabilities often encounter institutional neglect. Individuals living with HIV/AIDS frequently suffer from societal stigma and discrimination, further aggravating their health vulnerabilities.

Constitutional protections play a pivotal role in addressing these disparities and safeguarding the right to health. Article 21 of the Indian Constitution, which guarantees the fundamental right to life, has been judicially interpreted to encompass the right to health, recognizing its indispensability for a life of dignity. Furthermore, the Directive Principles of State Policy, such as Articles 39(e), 42, and 47, provide a framework for state action to promote public health, secure just and humane working conditions, and improve nutrition and living standards. While these principles are non-justiciable, they serve as guiding values for policymaking and governance.

Prioritising the health rights of vulnerable groups is essential to achieving Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all. By addressing the structural inequities that hinder access to healthcare, India can move closer to realising its constitutional ideals and fulfilling its global commitments to health equity and inclusivity. This article examines the constitutional and judicial mechanisms that protect the right to health for vulnerable groups, shedding light on successes, gaps, and pathways for reform.

Analysis of Constitutional Framework

India's Constitution provides a comprehensive framework for the protection and promotion of the right to health, drawing upon both enforceable fundamental rights and non-justiciable Directive Principles of State Policy. Together, these provisions underscore the State's commitment to ensuring health equity and addressing the needs of vulnerable groups.

The fundamental rights guaranteed under the Constitution play a crucial role in safeguarding public health. Article 21, which enshrines the right to life, has been expansively interpreted by Indian courts to include the right to health. Judicial pronouncements have consistently emphasised that the State's obligation to preserve and promote public health is integral to the right to life, encompassing access to medical care, a clean and safe environment, and adequate nutrition. This interpretation underscores that health is an essential precondition for a life of dignity. Additionally, Articles 14 and 15, which guarantee equality before the law and prohibit discrimination based on factors such as gender, caste, religion, or any other, have been instrumental in dismantling barriers to healthcare access for marginalised populations. These provisions foster an inclusive approach to

health services, ensuring that no individual is denied care based on their social identity.

In addition to fundamental rights, the Directive Principles of State Policy further guide the State's responsibilities towards health. Article 39(e) mandates the State to safeguard the health and strength of workers, protecting them from conditions that could be detrimental to their well-being. This provision emphasises the need for humane work environments and policies that address occupational health hazards. Article 42, which requires the provision of maternity relief, highlights the State's obligation to ensure the health of women, particularly during vulnerable periods such as pregnancy and childbirth. Similarly, Article 47 imposes a duty on the State to raise nutrition levels, improve public health, and prohibit the consumption of harmful substances, reinforcing the need for holistic public health measures.

Moreover, Indian Constitution empowers local governance structures through provisions like Article 243G, which allows Panchayats to implement health-related schemes within their jurisdiction. The Eleventh Schedule of the Constitution lists health and sanitation, drinking water, family welfare, and women and child development as key areas within the jurisdiction of Panchayats. This decentralisation of health governance is critical for addressing local health needs and ensuring that vulnerable groups have access to essential services.

These constitutional provisions collectively form the foundation for protecting and advancing the right to health in India. Through judicial interpretations and legislative actions, the framework aims to address health disparities and promote the well-being of all citizens, with a particular focus on vulnerable groups.

Judicial Interpretations

The Indian judiciary has played a critical role in interpreting the Constitution to expand the scope of the right to health, particularly under Article 21. Through landmark judgments, the courts have recognized health as an integral part of the right to life and personal liberty, contributing to the broader constitutional objective of ensuring equitable access to healthcare, especially for vulnerable groups.

The recognition of health as a fundamental right is evident in several landmark judgments. In *Vincent Panikurlangara v. Union of India (1987)* [4], the Supreme Court held that public health is an essential component of Article 21, emphasising the State's obligation to maintain and improve public health systems. The Court observed that the failure to ensure public health violates the constitutional right to life, placing an undue burden on individuals, particularly those from marginalised sections. Similarly, in *Consumer Education and Research Center v. Union of India (1995)* [5], the Supreme Court reinforced that the right to health is an important aspect of the right to life and dignity under Article 21. It highlighted the State's duty to ensure access to healthcare facilities and safeguard workers' health through appropriate policies and programs. This judgement extended the interpretation of life to include a life of dignity, where health is fundamental to personal well-being and human development.

Several judgments have focused specifically on the protection of vulnerable groups' health rights. In *Bandhua Mukti Morcha v. Union of India (1984)*

[6], the Court addressed the plight of bonded labourers, emphasising that the right to live with dignity, as guaranteed by Article 21, includes access to healthcare. The judgement connected health rights with Directive Principles, such as Articles 39(e) and 42, mandating the State to address health inequities in the workforce. Similarly, in *Paschim Banga Khet Mazdoor Samity v. State of West Bengal (1996)* [7], the Court ruled that the denial of immediate medical treatment by government hospitals violates the right to life under Article 21. It emphasised the State's obligation to establish an adequate healthcare system capable of addressing emergencies, particularly for vulnerable and rural populations who may not have alternative access to medical care.

These judgments have been instrumental in reinforcing the right to health as an integral part of the right to life, particularly for society's most vulnerable sections. Through these decisions, the judiciary has expanded constitutional protections and held the State accountable for addressing systemic gaps in healthcare access and delivery.

Further, several important judgments have illustrated the practical applications of the right to health in various contexts. For instance, in *Union of India v. Mool Chand Khairati Ram Trust* [8], the Supreme Court emphasised that access to life-saving drugs is a fundamental right under Article 21. The Court directed the government to ensure that intellectual property laws, including patents on medicines, do not obstruct access to affordable healthcare. This case highlighted the State's duty to balance public health needs with global trade obligations. Additionally, in *M.C. Mehta v. Union of India (1987)* [9], the Court recognized the right to a clean and safe environment as part of the right to health. The case, which dealt with industrial pollution, saw the Court direct industries to adopt safety measures to protect public health. This judgement connected environmental protection with health rights, linking Article 21 with Article 48A, which mandates the State to improve and protect the environment.

These judicial interpretations collectively demonstrate the proactive role the judiciary has played in advancing the right to health in India. By interpreting constitutional provisions expansively and addressing systemic inequities, these judgments have significantly contributed to the evolution of health jurisprudence, ensuring that the State remains accountable for upholding the health and well-being of its citizens.

Challenges and Gaps

Despite progressive judicial interpretations and constitutional provisions, significant challenges and gaps persist in ensuring equitable access to healthcare in India. These challenges, spanning legislative, implementation, and socioeconomic domains, continue to hinder the realisation of the right to health, particularly for vulnerable groups.

One of the primary legislative challenges is the absence of explicit recognition of the right to health in the Indian Constitution. While judicial interpretations have expanded the scope of Article 21 to include the right to health, the Constitution does not formally recognize it as a standalone fundamental right. This lack of clear, explicit recognition limits the potential for direct enforcement and comprehensive legislative action that could more effectively address health

inequities. The absence of a specific legal provision creates a gap in the healthcare system, leaving the issue of health rights vulnerable to inconsistencies in enforcement and insufficient policy initiatives. A parallel can be drawn with the right to education, which was judicially recognized as part of Article 21 in cases like *Mohini Jain v. State of Karnataka* [10] and *Unni Krishnan v. State of Andhra Pradesh* [11]. Despite this recognition, the addition of Article 21A through a constitutional amendment was necessary to provide a more concrete legal framework and facilitate the enactment of comprehensive legislation like the *Right to Education Act, 2009*, ensuring enforceability and systemic reforms. Similarly, while the judiciary has acknowledged the right to health under Article 21, its formal recognition as a standalone fundamental right could strengthen India's legal and institutional framework, enabling targeted policies and legislation to address inequities and establish healthcare as a legally enforceable obligation.

Healthcare infrastructure in India, especially in rural and marginalised areas, remains underdeveloped [12]. Vulnerable groups such as women, children, and persons with disabilities often face significant barriers in accessing basic health facilities. The inadequacy of healthcare services in these areas leads to disparities in health outcomes, with many marginalised populations unable to obtain even basic medical care. This systemic shortcoming contributes to widening health inequities, particularly in less developed regions where the availability of healthcare resources and skilled personnel is severely limited.

In addition to legislative and infrastructural gaps, implementation challenges also persist, particularly regarding the application of judicial directives. Although there have been landmark rulings emphasising the right to health, the enforcement of these judgments is uneven across states. Administrative inefficiencies, lack of resources, and insufficient political will contribute to this disparity [13]. As a result, many vulnerable populations remain underserved, and the full potential of judicial interventions is not realised in practice. The uneven application of judicial directives aggravates existing health inequities, leaving significant portions of the population without access to essential services.

Discrimination within healthcare systems further compounds the challenges to achieving equitable access. Persons with disabilities and individuals living with HIV/AIDS often face stigma and marginalisation in healthcare settings, which results in delayed or inadequate treatment [14]. This discrimination leads to worsened health outcomes for already vulnerable populations and deepens systemic health disparities. The failure of healthcare providers to ensure equal treatment for all individuals undermines the constitutional guarantee of health equity and perpetuates social exclusion.

On the socioeconomic front, India faces significant barriers in healthcare access, primarily due to high out-of-pocket expenditure. India has one of the highest rates of out-of-pocket expenditure on healthcare in the world, which disproportionately affects marginalised populations [15]. The financial burden of healthcare services prevents many vulnerable individuals from seeking necessary medical treatment. This economic barrier aggravates health inequities and contributes to the continuation of health disparities between

socioeconomic groups. Additionally, many vulnerable populations remain unaware of their legal rights to healthcare under the Indian Constitution and various welfare schemes. This lack of awareness prevents individuals from seeking judicial remedies or advocating for their rights when they are denied healthcare services. Legal literacy among marginalised groups is essential to empower them to demand the healthcare services they are entitled to, as enshrined in the Constitution.

CONCLUSION

India's constitutional framework, supported by progressive judicial interpretations, has significantly advanced the recognition of the right to health as an integral part of the right to life under Article 21. Judicial interventions have underscored the State's responsibility to provide equitable healthcare, protect vulnerable groups, and uphold the health and dignity of all citizens. However, challenges such as legislative gaps, uneven policy implementation, and inadequate healthcare infrastructure continue to impede the full realization of these constitutional commitments.

To address these shortcomings, enacting comprehensive legislation that explicitly recognizes the right to health as a fundamental right is essential. Such legislation should clearly delineate the State's obligations, establish accountability mechanisms, and safeguard the rights of vulnerable groups. Simultaneously, improving healthcare infrastructure—particularly in marginalized areas—is crucial. This includes targeted investments in primary healthcare centers, mobile health units, emergency services, and healthcare technology. Public awareness campaigns should be prioritized to educate citizens, especially vulnerable groups, about their health rights and available welfare schemes. Collaboration with civil society organizations can further empower individuals to seek remedies for rights violations.

Aligning national health policies with Sustainable Development Goal 3 is critical for promoting inclusivity and equity. This requires reducing out-of-pocket healthcare expenditures, improving access to essential medicines, and addressing social determinants of health such as nutrition, clean water, and sanitation. By implementing these measures, India can bridge the gaps in its healthcare system, protect the health rights of vulnerable groups, and fulfill its constitutional and international obligations. Equitable healthcare is not just a legal mandate but a moral imperative for promoting a just and inclusive society.

REFERENCES

1. United Nations Development Programme (UNDP). Leaving no one behind in the 2030 agenda: Roma inclusion in Europe [Internet]. New York: UNDP; 2018. Available from: https://www.undp.org/sites/g/files/zskgke326/files/migration/eurasia/LeavingNoOneBehindinthe2030Agenda_Roma-inclusion-in-Europe.pdf [Last accessed on 2023 Apr 19].

2. Pestova N. The right to health for vulnerable and marginalised groups: Russia as a case study [Internet]. Available from: https://www.researchgate.net/publication/288647780_ [Last accessed on 2023 Apr 19].

3. Khanday ZA, Akram M. Health status of marginalized groups in India. Int J Appl Sociol. 2012;2(6):60–70. doi: 10.5923/j.ijas.20120206.02.

4. (1987) 2 SCC 165 [Internet]. Available from: https://indiankanoon.org/doc/1305721/ [Last accessed on 2023 Apr 20].

5. (1995) 3 SCC 42 [Internet]. Available from: https://indiankanoon.org/doc/1657323/ [Last accessed on 2023 Apr 20].

6. (1984) 3 SCC 161 [Internet]. Available from: https://indiankanoon.org/doc/595099/ [Last accessed on 2023 Apr 20].

7. (1996) 4 SCC 37 [Internet]. Available from: https://indiankanoon.org/doc/1743022/ [Last accessed on 2023 Apr 20].

8. AIR 2018 Supreme Court 5426 [Internet]. Available from: https://indiankanoon.org/doc/116024620/ [Last accessed on 2023 Apr 20].

9. 1987 AIR 1086 [Internet]. Available from: https://indiankanoon.org/doc/1486949/ [Last accessed on 2023 Apr 15].

10. 1992 AIR 1858 [Internet]. Available from: https://indiankanoon.org/doc/40715/ [Last accessed on 2023 Apr 18].

11. 1993 AIR 2178 [Internet]. Available from: https://indiankanoon.org/doc/1775396/ [Last accessed on 2023 Apr 14].

12. IIHMR Delhi. Healthcare challenges in rural India [Internet]. IIHMR Delhi Blog. Available from: https://iihmrdelhi.edu.in/blog/healthcare-challenges-in-rural-india/#:~:text=One%20of%20the%20most%20pressing,Socio%2Deconomic%20Factors [Last accessed on 2023 Apr 16].

13. Challenges to Healthcare in India - The Five A's. Indian Journal of Community Medicine. 2018 Jul;43(3):141–3. doi: 10.4103/ijcm.IJCM_194_18. Available from: https://www.researchgate.net/publication [Last accessed on 2024 Apr 20].

14. Fauk NK, Hawke K, Mwanri L, Ward PR. Stigma and discrimination towards people living with HIV in the context of families, communities, and healthcare settings: a qualitative study in Indonesia [Internet]. Available from: https://www.mdpi.com/1660-4601/18/10/5424/review_report [Last accessed on 2023 Apr 18].

15. Sriram S, Albadrani M. Impoverishing effects of out-of-pocket healthcare expenditures in India [Internet]. Available from: https://www.semanticscholar.org/paper/ [Last accessed on 2023 Apr 19].

Citation: Asdaque SS, Hasan A. Ensuring the Right to Health of Vulnerable Groups: An Analysis of India's Constitutional Framework. National Journal of Medical and Allied Sciences 2023; 12(2): 3-9

Conflicts of Interest: Nil Source of Funding: Nil

Date of Acceptance: 15-08-2023

Date of Submission: 01-06-2023

National Journal of Medical and Allied Sciences

[ISSN Online: 2319 – 6335, Print: 2393 – 9192|Short Communication |Open Access]

FROM LUSH PONDS TO DECREASED PLATELET COUNTS- DENGUE SEROTYPES DURING THE COVID-19 PANDEMIC IN FIROZABAD, UTTAR PRADESH

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ABSTRACT

Dengue is a major arboviral disease caused by four primary serotypes of the Dengue virus (DENV-1 to DENV-4), with recent reports of a fifth serotype (DENV-5). Transmitted mainly by *Aedes aegypti* mosquitoes breeding in freshwater habitats, dengue infection can range from mild febrile illness to severe complications like hemorrhagic fever and shock, often associated with thrombocytopenia. Globally, dengue cases have increased exponentially, with India reporting over 1.93 lakh cases in 2021.

This study, the first from Firozabad district, Uttar Pradesh, investigates circulating dengue serotypes following the Coronavirus disease 2019 (COVID-19) pandemic. Between June and September 2021, 25 NS1-positive samples were analyzed via RT-PCR, revealing a 92% dengue positivity rate. DENV-2 was the predominant serotype (69.56%), followed by DENV-3 (13.04%), with some cases of mixed infections involving DENV-2 & DENV-3 and DENV-1 & DENV-3. Environmental factors like temperature and rainfall influence dengue transmission, which may be further affected by climate change and urbanization.

Understanding prevalent serotypes is crucial for clinical management, outbreak prediction, vector control, and vaccine development. Continuous surveillance post-pandemic is vital for effective dengue control strategies in the region.

Key words: Dengue virus, Serotypes, Post-COVID-19 surveillance,. Uttar Pradesh

INTRODUCTION

Dengue, the arboviral disease, poses a significant global health threat. The Dengue virus, belonging to the Flaviviridae family is widely distributed throughout the tropics and subtropics. To date four serotypes have been identified: Dengue virus serotype 1 (DENV-1), DENV-2, DENV-3 and DENV-4. These serotypes are genetically related but antigenically distinct causing Dengue infection in humans.[1] Recently, a fifth serotype, DENV-5,was isolated in 2013 and is known to follow the sylvatic cycle.[2] The primary vector for the Dengue virus is the *Aedes aegypti* mosquito which is known

to survive and multiply in fresh water; natural and artificial water holding sites like tree holes, ponds, domestic water containers, earthen pots, drums, tyres etc. being the preferred breeding sites.[3,4]A study conducted in Delhi reported that the Dengue infection rose in the months following rainfall rising highest in September and October.[5] Dengue virus transmission generally leads to a mild, self-limiting febrile illness and the most common symptoms are high fever, headache, body aches, joint pain, nausea, vomiting and rash. However, the complications can lead to Dengue haemorrhagic fever or dengue shock syndrome which may cause damage of lymphatic system and blood vessels, epistaxis, ecchymosis, haemorrhage, bleeding from the gums, hepatomegaly and circulatory system failure. Thrombocytopenia is a very common clinical manifestation in dengue infection. The Dengue virus can directly or indirectly damage bone marrow progenitor cells, reducing the proliferative ability of haematopoietic cells.[6] Thrombocytopenia may result from either decreased bone marrow cell production or accelerated platelet breakdown and clearance from the peripheral circulation.[7]

There has been an incessant rise in the Dengue cases worldwide in the recent decades, wherein, the WHO reported 5,05,430 cases in 2000 which increased to 5.2 million in 2019, with the highest number of dengue cases recorded in 2023.[8] Outbreaks of the four dengue virus serotypes have been increasingly reported in the tropics and subtropics, mostly in Asia, South America and the Caribbean.

Several virus serotypes have been detected cocircul ating in the hyperendemic regions of Southeast Asia and the Pacific.[9] In India more than 100,000 cases of dengue infection are reported annually and in 2021 more than 1.93 lakh cases were documented, maximum being from the states of Uttar Pradesh and Punjab.[10] The Dengue serotypes which have generally progressed from a common ancestor are considered as the causative agent of essentially identical illness spectrum in the humans, due to Dengue selecting distinct receptors based on cell types and virus strains.[11] DENV-2 and DENV-3 have been associated with more serious disorders especially during secondary infections, while DENV-1 and DENV-4 are associated with less severe illness.[12] As per the "antibody-dependent enhancement" (ADE) theory, the antibodies from a previous dengue infection can enhance the entry of the virus into cells during a subsequent infection with a different serotype which attributes to difference in severity.[13]

MATERIAL AND METHODS

This is the first study from Firozabad district of Uttar Pradesh, India, to report on the prevalence of different Dengue virus serotypes circulating within the local population, especially following the surge of COVID-19. During the period from June to

September 2021, immediately after the second wave of the COVID-19 pandemic, the Department of Microbiology at Autonomous State Medical College, Firozabad, serotyped 25 Dengue NS1-reactive samples using conventional RT-PCR, alongside RT-PCR testing for the COVID-19 virus.

RESULTS

Out of these, twenty three (92%) cases were confirmed of dengue virus. None were COVID-19 positive. In this study DENV-1, DENV-2 and DENV-3 serotypes were identified. Maximum cases, sixteen (69.56%) were of serotype DENV-2, followed by three (13.04%) cases infected with DENV-3 serotype. Mixed infection with DENV-2 & DENV-3 serotypes was seen in three (13.04%) cases and one case (4.34%) was mixed infection with serotypes DENV-1 and DENV-3.

Table 1: Distribution of Dengue Virus Serotypes and Co-infections Among Confirmed Cases

Parameter	Number of Cases (n=23)	Percentage (%)
Total dengue-confirmed cases	23	92%
COVID-19 positive cases	0	0%
Dengue Serotype Distribution		
DENV-2	16	69.56%
DENV-3	3	13.04%
Mixed Serotype Infections		
DENV-2 & DENV-3	3	13.04%
DENV-1 & DENV-3	1	4.34%

DISCUSSION

Our study was in concordance with results from Rajasthan where 60% cases were infected with DENV-2 or DENV-3 serotypes.[14] However, another study conducted in Southeastern Andhra Pradesh found predominantly DENV-2 serotype followed by DENV-4.[15] Yung et al also reported DENV-2 as the most prevalent serotype in Singapore.[16]

The interaction between dengue virus, the host and the environment is dynamic. The rise in rural-urban migration or urbanization increases the likelihood of genetic changes leading to diversity in virus population. The environmental factors like increase in temperature and rainfall are predictors of Dengue incidence and the vector control should be implemented at least two months prior to disease progression.[5] However, the erratic changes in the environment due to global warming pose a threat to the change in dynamics of Dengue ecology by increasing vector ranges, broadening the duration of vector activity and having a domino effect on the vectors' infectious period as vectors might adapt to new environments and climate.[17]

CONCLUSION

Dengue virus serotyping is crucial to assess the severity of the infection, guiding efficient

management of the patients. It helps in understanding the risk of secondary infections particularly when caused by different serotypes than the prior infection. Besides, it helps in monitoring outbreaks and strategizing targeted vector controls. Additionally, it aids in understanding the dengue virus evolution and vaccine development. Furthermore, understanding how environmental changes influence dengue transmission dynamics is vital for predicting and mitigating future outbreaks.

REFERENCES

1. Chen R, Vasilakis N. Dengue-quo tuet quo vadis? Viruses2011; 3:1562-1608. doi:10.3390/v3091562.

2. Mustafa MS, Rasotgi V, Jain S, Gupta V. Discovery of fifth serotype of dengue virus (DENV-5): A new public health dilemma in dengue control. Medical journal armed forces India 2014; 71(1):67 - 70. http://dx.doi.org/10.1016/j.mjafi.2014.09.011

3. Madzlan F, Dom MC, Tiong CS, Zakaria N .Breeding characteristics of *Aedes* mosquitoes in dengue risk area. Proced. Soc. Behav. Sci.2016; 234(4):164-172.

4. Awang MF, Che DM. The effect of temperature on the development of immature stages of *Aedes* spp. against breeding containers. Int. J. Glob. Warm.2020;21(3):215-233. doi:10.1504/IJGW.2020.108671.

5. Singh PS, Chaturvedi HK. A retrospective study of environmental predictors of dengue in Delhi from 2015 to 2018 using the generalized linear model. Scientific Reports.2022;12:8109 . https://doi.org/10.1038/s41598-022-12164-x

6. Das S, Abreu C, Harris M, Shrader J, Sarvepalli S. Severe Thrombocytopenia Associated with Dengue Fever: An Evidence-Based Approach to Management of Thrombocytopenia. Case Rep Hematol. 2022 Aug 12;2022:3358325. doi: 10.1155/2022/3358325.

7. Basu A, Jain P, Gangodkar SV,. Shetty S, and Ghosh K. Dengue 2 virus inhibits in vitro megakaryocytic colony formation and induces apoptosis in thrombopoietin-inducible megakaryocytic differentiation from cord blood CD34+ cells. FEMS Immunology and Medical Microbiology 2008;53(1):46–51. doi: 10.1111/j.1574-695X.2008.00399.x

8. World Health Organization. Dengue and severe dengue. Available at https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue Last accessed 23 April 2023

9. WHO World Health Organization—Geneva. Global strategy for dengue prevention and control 2012–2020. WHO Library Cataloguing-in-Publication Data, Switzerland: 2012.

10. National Centre for Vector Borne Diseases Control. Dengue. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=431&lid=3715 Last accessed 23 April 2023

11. Ohmann HB, Meyer M, Fitzpatrick DR, and Mackenzie JS. Dengue virus binding to human leukocyte cell lines: receptor usage differs between cell types and virus strains. Virus Research.2001;73(1):81–89.

12. Nisalak A, Endy TP, Nimmannitya S, Kalayanarooj S, Scott RM, Burke DS, et al. Serotype-specific dengue virus circulation and dengue disease in Bangkok, Thailand from 1973 to

1999. The American J of tropical med and hygiene. 2003; 68(2):191–202.

13. Flipse J, Diosa-Toro MA, Hoornweg TE, Van De Pol DP, Urcuqui-Inchima S, Smit JM. Antibody-dependent enhancement of dengue virus infection in primary human macrophages; balancing higher fusion against antiviral responses. Sci. reports 2016; 6:29201. https://doi.org/10.1038/srep29201.

14. Gupta A, Rijhwani P, Pahadia M R, Kalia A, Choudhary S, Bansal DP, et al. Prevalence of Dengue Serotypes and Its Correlation with the Laboratory Profile at a Tertiary Care Hospital in Northwestern India. Cureus 2021;13(5): DOI 10.7759/cureus.15029.

15. Racherla RG, Pamireddy ML, Mohan A, Mudhigeti N, Mahalakshmi PA, Nallapireddy U, Kalawat U. Cocirculation of four dengue serotypes at South Eastern Andhra Pradesh, India: a prospective study. Indian J Med Microbiol. 2018;36:236-240. https://doi.org/10.4103/ijmm.IJMM_18_109

16. Yung CF, Lee KM, Thein TL, Tan LK, Gan VC, Wong JGX, et al Dengue Serotype-Specific Differences in Clinical Manifestation, Laboratory Parameters and Risk of Severe Disease in Adults, Singapore Am. J. Trop. Med. Hyg 2015; 92(5):999-1005.doi:10.4269/ajtmh.14-0628.

17. Morin CW, Comrie AC, Ernst K. Climate and dengue transmission: Evidence and implications. Environ. Health Perspect. 2013;121(11–12):1264–1272. https://doi.org/10.1289/ehp.1306556

Conflicts of Interest: Nil Source of Funding: Nil

Citation Tuli L, Shariq M. From Lush Ponds To Decreased Platelet Counts- Dengue Serotypes During The COVID-19 Pandemic In Firozabad, Uttar Pradesh. National Journal of Medical and Allied Sciences 2023; 12(2):10-14

Date of Acceptance: 29-05-2023

Date of Submission: 23-04-2023

National Journal of Medical and Allied Sciences

[ISSN Online: 2319 – 6335, Print: 2393 – 9192|Original Article |Open Access]

Website:-www.njmsonline.org

RELATION OF BURNOUT TO ON-CALL DUTIES AMONG SAUDI BROAD RESIDENTS IN ASEER REGION: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Resident burnout is a prevalent concern characterized by emotional exhaustion (EE), depersonalization (DP), and reduced personal accomplishment (PA). These dimensions significantly impact residents' mental health and professional performance.

Materials and Methods: This cross-sectional study was conducted among 260 residents across various hospitals in the Aseer region of Saudi Arabia. The Maslach Burnout Inventory (MBI) was used to assess burnout subscales, with responses analyzed as percentages. Cronbach's alpha evaluated the reliability of each subscale. Subscale scores were expressed as mean ± SD. Multiple linear regression analyses examined the relationship between on-call duty hours and burnout dimensions, while mediation analysis with the Sobel test and bootstrapping assessed the indirect effect of on-call hours on burnout through satisfaction.

Results: The participants were predominantly female (52.7%), aged 27-29 years (63.1%), and unmarried (63.1%). The most common specialties were pediatrics (16.9%) and psychiatry (13.5%), with 29.6% in their first year of residency. Most residents (90%) reported responding to on-call duties lasting 17-24 hours, and only 36.5% slept 3-4 hours post-call. High EE was observed in 72%, high DP in 68%, and high PA in 37%. Regression analyses revealed that on-call shifts of 17-24 hours significantly increased EE (β=6.95, p=0.002) and DP (β=6.95, p=0.002). Conversely, post-call rest of 1-2 hours significantly reduced fatigue (β=-0.8, p=0.028). Longer post-call rest periods (3-4 hrs, 5-6 hrs) were associated with higher PA scores, indicating increased personal accomplishment and reduced burnout. Mediation analysis showed that satisfaction significantly mediated the relationship between on-call hours and PA, increasing it by 2.32 units (p=0.042).

Conclusion: Resident burnout rates are alarmingly high among Saudi residents in Aseer. Implementing measures such as limiting on-call shifts to 16 hours and ensuring adequate post-call rest are essential to improve residents' well-being and mitigate burnout.

Key words: Maslach, burnout, on-call, residents, emotional exhaustion, depersonalization, personal accomplishment, satisfaction.

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INTRODUCTION

Burnout is a prevalent psychological syndrome, described as a condition of physical and emotional tiredness brought on by work or caring for others.[1] Dealing with occupations that require interaction with people; therefore, it is common among healthcare providers due to exposure to chronic and work-related stress. [2]

Burnout is a multidimensional syndrome consisting of three components: emotional exhaustion (EE), which occurs when emotional resources are depleted and physicians feel they can no longer give their best psychologically; and depersonalization (DP), which occurs when physicians develop a pessimistic attitude and feelings about their patients, and reduced personal accomplishment (PA), a tendency to negatively evaluate themselves. [3]

According to estimates, every third physician experiences at least one aspect of medical burnout. The burnout epidemic is becoming more widespread. Burnout affects medical students in the US at a rate of 31% to 49.6%, physicians at a rate of 30%, and residents at a rate of 50% to 76%. Research by residents of internal medicine at the University of Washington revealed that 76% of them met the MBI burnout criteria [4], and there have been reports of high levels of burnout in several emerging nations, including Malaysia, Saudi Arabia, Lebanon, and Egypt (63.1%).[4-7] On-call duty hours and post-call duty hours play a fundamental role in burnout among medical residents. Prolonged awake for 24 h causes cognitive impairment, which is equal to a 0.004% rise in blood alcohol content.[8] Additionally, a number of studies have shown that residents who deal with sleep disorders experience increasing feelings of empathy and isolation. In particular, a recent longitudinal study that tracked residents who worked more than 48 hours a week reported that their risk of medical errors, avoidable adverse events, and occupational injuries increased, and at 60 hours or more, their risk doubled [9]. Shalaby et al., 2023 reported that the prevalence of burnout among residents was 58.2%, and working more than 80 hours a week significantly increased burnout more than five times. [10]

Burnout has detrimental consequences for the health system. These include physical and mental health illnesses, depression, suicidal thoughts, workplace disputes, absenteeism, poor job performance, reduced job commitment, and poor patient care practices. This in turn can eventually force doctors to leave the medical industry [6, 11].

In Saudi Arabia, many studies have discussed burnout among residents of Riyadh, Jaddah, and Al-Madina. Aldrees et al.,2013 reported a high EE of 54%, a high DP of 35%, and a high PA of 33%. Khalid Bawakid et al. (2017) reported that 69.5% of residents had high EE, while Aldubai et al. (2019) reported 32% burnout according to the EE subscale only. However, these studies did not focus on the effect of on-call duty hours on burnout, used different cutoff points, or reported only for the EE dimension.[6, 12, 13]

In this study, we hypothesized that longer on-call duty hours with fewer post-call hours among Saudi residents in the Aseer region would increase burnout, as represented by the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) with its three dimensions, EE, DP, and PA.

Material and Methods

This cross-sectional study was conducted in the Aseer region, Kingdom of Saudi Arabia (KSA). The study population included residents in the Aseer region, KSA, who agreed to participate in the study and were assigned on-call duties.

Primary outcome: Assess the impact of on-call hours on burnout subscales EE, DP, and AP among Saudi residents.

Secondary outcome: assess the burnout subscales predictors in direct and indirect way.

Study tool

The Maslach Burnout tool was used. This validated tool consists of three subscales: EE (nine questions), DP (five questions), and PA (eight questions).[14] The higher the exhaustion or depersonalization scores, the higher the burnout, and the higher the personal accomplishment score, the lower the burnout. The cutoff point for each subscale was derived from Viva Combs Thorsen et al. (2011). [15] Questions on demographics, age group, gender, marital status, number of children, residency program, residency year, number of on-call hours, and post-call hours were added to the questionnaire.

Operational definitions:[14]

EE: Feelings of being emotionally overextended and worn out by one's work are referred to as emotional tiredness. It is defined as the depletion of emotional resources and represents the stress factor of burnout.

DP: The process of responding to those receiving one's care or assistance in an impersonal and unfeeling way, which results in a harsh and distant attitude toward those with whom one is dealing. It also displays the interpersonal aspects of burnout.

AP: Feelings of competence and effective achievement in one's work with others are referred to as personal accomplishments. In contrast to EE and DP, burnout is a positive component of burnout and reflects the self-evaluation features of burnout.

Sample size calculation

Sample 259 was calculated using the Raosoft online calculator to achieve a power of 80% and significance level of 0.05.

Ethical approval

Ethical approval was received from King Khalid University, KSA (ECM#2023-804). The data collection process was aligned with the ethical committee of the King Khalid University.

Data collection procedure

A self-administered structured questionnaire based on the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was administered to 260 residents between 2023 and 2024. The questionnaire was administered at the Aseer Central Hospital, Khamis Mushet General Hospital, Abha Maternity and Children Hospital, Mental Health Hospital, and Armed Force Hospital. The tool has been applied to different residency years and programs, such as

pediatrics, emergency medicine, internal medicine, psychiatry, gynecology, neurology, orthopedics, general surgery, ophthalmology, and radiology.

Statistical analysis

SPSS version 24.0 was used for all the analyses. The study characteristics and responses are described as percentages. Cronbach's alpha was calculated for each subscale as recommended in the Maslach Burnout Inventory Manual. The score of each subscale was calculated as the mean ± SD. The t-test and one-way analysis of variance (ANOVA) were used to assess the significance of differences among the characteristic levels for each subscale. To measure the effect of on-call hours on burnout subscales, multiple linear regressions were performed for each subscale after testing the model for linearity, normality, autocorrelation, and multicollinearity using the variance inflation factor (VIF). The best model was selected based on the lowest Akaike information criterion (AIC). Mediation analysis was conducted using the Sobel test and bootstrapping, as it is the most appropriate method to assess the indirect effect of on- call hours on burnout subscales mediated by satisfaction. The results were considered significant when the p-value was <0.05.

Results

From the 260 respondents, 52.7% were female, 63.1% were in the age group of 27-29 years, and 63.1% were single.

Table 1: Characteristics of Residents

Characteristics	Level	N (%)	EE	DP	AP
Age group	24 -26 years	74(28.5)	**0.002**	0.338	0.184
	27 -29 years	164 (63.1)			
	30 or above	22 (8.5)			
Gender	Male	123 (47.3)	0.078	0.713	0.073
	Female	137 (52.7)			
Marital status	Single	164 (63.1)	0.42	0.755	0.256
	Married	89(34.2)			
	Divorced	7 (2.7)			
Children	No	68(26.2)			
	Yes	43(16.5)			
Residency program	Pediatrics	44(16.9)	**<0.001**	0.426	**<0.001**
	Psychiatry	35(13.5)			
	Radiology	17(6.5)			
	Gynecology	26(10.0)			
	Internal medicine	31(11.9)			
	ENT	23 (8.8)			
	Orthopedic	15 (5.8)			
	Surgery	21 (8.1)			
	Dermatology	20 (7.7)			
	Ophthalmology	21 (8.1)			
	Neurology	2 (0.8)			
	Preventive medicine	1 (0.4)			
	Emergency medicine	2 (0.8)			
	Family planning	1 (0.4)			
	Maxillofacial	1 (0.4)			
Year of residency	R1	77 (29.6)	**0.002**	0.377	**0.015**
	R2	71 (27.3)			
	R3	59 (22.7)			
	R4	46 (17.7)			
	R5 or more	7 (2.7)			
On-calls hours	1-8hr	12 (4.6)	0.065	0.093	**0.002**
	9-16hr	13 (5.0)			
	17-24hr	235 (90.4)			
Post-call hours	None	18 (6.9)	**0.020**	0.230	**<0.001**
	1-2hr	11 (4.2)			
	3-4hr	95 (36.5)			
	5-6hr	83 (31.9)			
	>6	53 (20.4)			

The most common residential specialties were pediatrics 16.9% and psychiatry (13.5%). Additionally, 29.6% were in their first year of residence. Ninety percent of the respondents reported responding to on-call duties for 17-24 hours, and only 36.5% took 3-4 hours of post-call rest. Residency programs, years, and post call hours showed significant differences between EE and AP. (**Table 1)**

Responses for the exhaustion, depersonalization, and personal accomplishment subscales are presented in **Table 2**.

The mean±SD for the exhaustion, depersonalization, and personal accomplishment subscales were 34.13±0.66, 12.81±0.35, and 34.13±0.96, respectively. The responses indicated that 72% of the residents experienced high exhaustion, 16% experienced moderate exhaustion, and 12% experienced low exhaustion.

Regarding depersonalization, 68% of the respondents reported high levels, 20% reported moderate levels, and 12% reported low levels. Additionally, the personal accomplishment scores revealed that 37% of the respondents had high scores, 23% had moderate scores, and 40% had low scores. The exhaustion and personal accomplishment subscales demonstrated high reliability with Cronbach's alpha values of 0.911 and 0.900, respectively. In contrast, the depersonalization subscale exhibited poor reliability, with Cronbach's alpha of 0.580. (**Table 3)**

Predictors for subscale domains

Multiple linear regression analyses of the EE subscale revealed several significant predictors. On-call hours of to 17-24 hours significantly increased exhaustion 6.95 (95% CI: 2.55 – 11.34, p = 0.002). Conversely, having 1-2 hours of post-call rest significantly decreased exhaustion -0.8 (95% CI: -15.14 – -0.86, p = 0.028). Residency in family and emergency medicine also significantly increased exhaustion, with coefficients of 29.59 (95% CI: 10.19 – 48.99, p = 0.003) and 19.61 (95% CI: 4.18 – 35.04, p = 0.013), respectively. Additional residencies in ENT, gynecology, internal medicine, orthopaedics, pediatrics, neurology, psychiatry, ophthalmology, and surgery were also associated with significantly increased exhaustion. Furthermore, being in the fifth year or beyond of residency significantly decreased exhaustion compared to the first year -14.18(95% CI: -23.21 – -5.15, p = 0.002). Gender, age, and marital status had no significant effect on exhaustion. (**Table 4)**

Table 2: The Maslach Burnout subscales

Maslach Burnout Subscales	Never	A few times a year or less	Once a month or less	A few times a month	Once a week n(%)	Every day n(%)
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
I. Emotional Exhaustion						
1. I feel emotionally drained from my work.	5	4	26	56	57	112
	(1.9)	(1.5)	(10)	(21.5)	(21.9)	(43.1)
2. I feel used up at the end of the workday.	2	10	16	35	44	153
	(0.8)	(3.8)	(6.2)	(13.5)	(16.9)	(58.8)
3. I feel fatigued when I get up in the morning and have to face another day on the job.	6	12	21	43	51	127
	(2.3)	(4.6)	(8.1)	(16.5)	(19.6)	(48.8)
6. Working with people all day is really a strain for me.	11	26	40	74	43	66
	(4.2)	(10)	(15.4)	(28.5)	(16.5)	(25.4)
8. I feel burned out from my work.	4	6	18	25	52	155
	(1.5)	(2.3)	(6.9)	(9.6)	(20)	(59.6)
13. I feel frustrated by my job.	3	29	31	66	52	79
	(1.2)	(11.2)	(11.9)	(25.4)	(20)	(30.4)
14. I feel I'm working too hard on my job.	2	12	10	21	45	170
	(0.8)	(4.6)	(3.8)	(8.1)	(17.3)	(65.4)
16. Working with people directly puts too much stress on me.	18	32	34	76	30	70
	(6.9)	(12.3)	(13.1)	(29.2)	(11.5)	(26.9)
20. I feel like I'm at the end of my rope.	15	36	36	46	33	94
	(5.8)	(13.8)	(13.8)	(17.7)	(12.7)	(36.2)
II. Depersonalization						
5. I feel I treat some recipients as if they were impersonal objects.	37	31	31	71	39	51
	(14.2)	(11.9)	(11.9)	(27.3)	(15)	(19.6)
10. I've become more callous toward people since I took this job.	23	30	20	36	49	102
	(8.8)	(11.5)	(7.7)	(13.8)	(13.8)	(39.2)
11. I worry that this job is hardening me emotionally.	34	67	46	42	31	40
	(13.1)	(25.8)	(17.7)	(16.2)	(11.9)	(15.4)
15. I don't really care what happens to some recipients.	173	35	16	17	13	6
	(66.5)	(13.5)	(6.2)	(6.5)	(5)	(2.3)
22. I feel recipients blame me for some of their problems.	40	48	28	54	42	48
	(15.4)	(18.5)	(10.8)	(20.8)	(16.2)	(18.5)
III. Personal Accomplishment						
4. I can easily understand how my recipients feel about things.	5	14	12	24	20	185
	(1.9)	(5.4)	(4.6)	(9.2)	(7.7)	(71.2)
7. I deal very effectively with the problems of my recipients.	3	12	10	22	39	174
	(1.2)	(4.6)	(3.8)	(8.5)	(15)	(66.9)
9. I feel I'm positively influencing other people's lives through my work.	11	13	18	25	32	161
	(4.2)	(5)	(6.9)	(9.6)	(12.3)	(61.9)
12. I feel very energetic.	27	35	62	71	32	33
	(10.4)	(13.5)	(23.8)	(27.3)	(12.3)	(12.7)
17. I can easily create a relaxed atmosphere with my recipients.	20	14	21	22	35	148
	(7.7)	(5.4)	(8.1)	(8.5)	(13.5)	(56.9)
18. I feel exhilarated after working closely with my recipients.	22	22	31	80	38	67
	(8.5)	(8.5)	(11.9)	(30.8)	(14.6)	(25.8)
19. I have accomplished many worthwhile things in this job.	14	11	18	29	32	156
	(5.4)	(4.2)	(6.9)	(11.2)	(12.3)	(60)
21. In my work, I deal with emotional problems very calmly.	8	15	17	44	51	125
	(3.1)	(5.8)	(6.5)	(16.9)	(19.6)	(48.1)

Table 3: Mean and reliability of the subscales

Maslach Burnout subscale	Mean (SD)	Cronbach alpha
Exhaustion	34.13±0.66	0.911
Depersonalization	12.81±0.35	0.580
Accomplishment	34.13±0.96	0.900

Table 4: Predictors of the exhaustion among residents in Aseer region

Predictors	Levels	Estimates	CI	p- value
(Intercept)		14.73	5.00 – 24.47	**0.003**
How many hours of on call?	1-8hrs	Reference		
	17-24 hrs	8.93	1.98 – 15.87	**0.012**
	9-16 hrs	-2.39	-10.98 – 6.21	0.585
How many hours of post call?	No post call	Reference		
	1-2 hrs	-8.00	-15.14 – -0.86	**0.028**
	3-4 hrs	-3.78	-8.79 – 1.23	0.139
	5-6 hrs	-3.38	-8.64 – 1.89	0.208
	Over 6 hrs	-2.98	-8.76 – 2.80	0.310
Residency	Dermatology	Reference		
	Emergency	19.61	4.18 – 35.04	**0.013**
	ENT	10.95	5.01 – 16.90	**<0.001**
	Family medicine	29.59	10.19 – 48.99	**0.003**
	Gynecology	18.62	13.18 – 24.05	**<0.001**
	Internal Medicine	18.61	12.92 – 24.30	**<0.001**
	Maxillofacial	13.71	-6.57 – 33.99	0.184
	Neurology	17.80	4.38 – 31.21	**0.010**
	Ophthalmology	12.02	5.03 – 19.00	**0.001**
	Orthopaedic	17.30	10.46 – 24.14	**<0.001**
	Pediatrics	17.49	12.04 – 22.94	**<0.001**
	Preventive medicine	4.49	-15.15 – 24.14	0.653
	Psychiatry	10.68	5.55 – 15.82	**<0.001**
	Radiology	18.58	12.69 – 24.48	**<0.001**
	Surgery	19.56	13.51 – 25.60	**<0.001**
Gender	Male	Reference		
	Female	2.23	-0.31 – 4.76	0.085
Age group	24-26 years	Reference		
	27-29 years	-1.71	-4.95 – 1.54	0.300
	Above 30 years	-5.15	-10.91 – 0.62	0.080
Marital status	Single	Reference		
	Divorced	-5.87	-13.49 – 1.75	0.131
	Married	1.10	-1.83 – 4.03	0.461
Year of residency	R1	Reference		
	R2	-1.80	-5.14 – 1.54	0.289
	R3	-2.40	-6.28 – 1.49	0.225
	R4	-3.44	-7.82 – 0.94	0.123
	R5 or above	-14.18	-23.21 – -5.15	**0.002**

Multiple linear regression demonstrated the DP predictors as on-call hours for 17-24 hrs increased depersonalizations significantly 6.95(95%CI: 2.55 – 11.34,p=0.002). In addition to the residency specialties, emergency, family, internal medicine, Pediatrics, and surgery significantly increased the depersonalization 9.79(95%CI: 0.03 – 19.55, p=0.049), 14.91(95%CI: 2.63 – 27.19, p=0.018), 5.76 (95%CI: 2.16 – 9.36, p=0.002), 3.51 (95%CI:0.06 – 6.95, p=0.046), and 4.46(9%CI: 0.64 – 8.29, p=0.002), respectively. Gender, age, year of residency, post call hours, and marital status had no significant impact on depersonalization. **Table 5**

Multiple linear regression illustrated that the predictors of PA as post call hours 1-2hrs, 3-4hr, and 5-6 hrs significantly increased accomplishment and lower burnout, 12.64(95%CI: 5.36 – 19.93,p=0.001), 12.32(95%CI: 7.20 – 17.43,p<0.001), and 10.75(95%CI: 5.37 – 16.12,p<0.001), respectively. Where the residency specialties such as family medicine, gynecology, neurology, pediatrics, and psychiatry significantly decreased the accomplishment, increased burnout, -21.94(95CI: -41.75 – -2.13,p=0.030), -7.68 (95% CI: 13.23 – -2.13, p=0.007), -18.26(95%CI: -31.96 – -4.57,p=0.009), -14.40 (95% CI: -19.96 – -8.83, p<0.001), and -5.80 (95%CI:-11.04 – -0.56,p=0.030), respectively. Gender, age, year of residence, on-call hours, and marital status had no significant impact on accomplishment. **Table 6**

Mediation analysis

To determine whether satisfaction had a mediation effect, the Sobel test was used. The mean satisfaction was calculated to be 4.73±1.73. The results indicate that the direct effect of on-call hours on exhaustion, depersonalization, and personal accomplishment was 2.97 (95%CI:0.15 – 5.80, p=0.039), 1.62 (95%CI: 0.10 – 3.13,P=0.037), and 5.31 (95%CI:2.43 – 8.19, p<0.001). The direct of on-call hours on satisfaction was significant 0.47 (95%CI:0.02 – 0.92, p=0.043). The indirect effect of on-call hours on exhaustion mediated by satisfaction non-significantly decreased exhaustion by -0.41 (95% CI: -0.95 – 0.11, p=0.125). The indirect effect of on-call hours on depersonalization mediated by satisfaction was non-significantly decreased DP -0.27 (95% CI: -0.60 – 0.04, p=0.096). The indirect effect of on-call hours on personal accomplishment mediated by satisfaction significantly increased by 2.32 (95% CI: 0.08 – 4.55, p=0.042) which lowered burnout. **Figure 1**

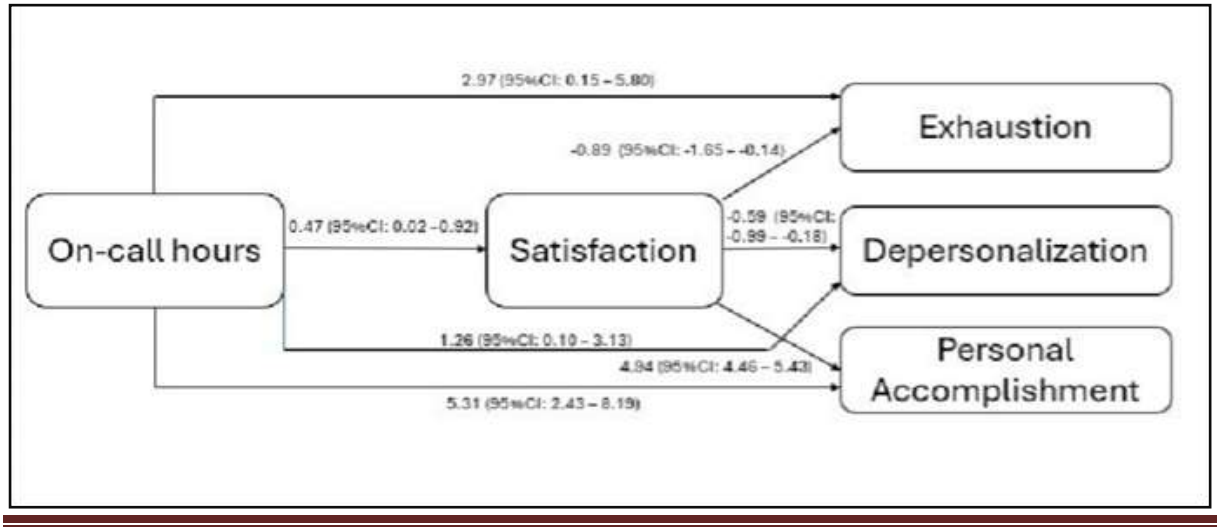

Table 5: Predictors of depersonalization among residents of the Aseer region

	Predictors	Estimates	CI	p- value
	(Intercept)	5.35	-0.81 – 11.51	0.089
How many hours of	9-16 hrs	Reference		
on call	17-24 hrs	6.95	2.55 – 11.34	**0.002**
	9-16 hrs	4.00	-1.44 – 9.43	0.149
How many hours of	No post call	Reference		
post call	1-2 hrs	-2.16	-6.68 – 2.36	0.347
	3-4 hrs	0.30	-2.87 – 3.47	0.854
	5-6 hrs	-0.98	-4.31 – 2.35	0.561
	Over 6 hrs	0.44	-3.22 – 4.09	0.814
Residency	Dermatology	Reference		
	Emergency	9.79	0.03 – 19.55	**0.049**
	ENT	3.64	-0.12 – 7.40	0.058
	Family medicine	14.91	2.63 – 27.19	**0.018**
	Gynecology	3.45	0.01 – 6.89	0.050
	Internal Medicine	5.76	2.16 – 9.36	**0.002**
	maxillofacial	1.19	-11.64 – 14.02	0.855
	Neurology	-1.71	-10.20 – 6.77	0.691
	Ophthalmology	-0.56	-4.98 – 3.86	0.805
	Orthopaedic	3.37	-0.96 – 7.70	0.127
	Pediatrics	3.51	0.06 – 6.95	**0.046**
	Preventive medicine	6.73	-5.70 – 19.16	0.287
	Psychiatry	2.19	-1.06 – 5.44	0.185
	Radiology	1.55	-2.18 – 5.28	0.414
	Surgery	4.46	0.64 – 8.29	**0.022**
Gender	Male	Reference		
	Female	-0.78	-2.38 – 0.83	0.341
Age group	24-26 years	Reference		
	27-29 years	-0.06	-2.12 – 1.99	0.951
	Above 30 years	-1.37	-5.02 – 2.27	0.458
Marital status	Single	Reference		
	Divorced	-2.40	-7.22 – 2.42	0.328
	Married	-0.82	-2.67 – 1.04	0.386
Year of residency	R1	Reference		
	R2	-0.91	-3.03 – 1.20	0.395
	R3	0.05	-2.41 – 2.50	0.970
	R4	0.86	-1.91 – 3.64	0.539
	R5 or above	-3.53	-9.24 – 2.18	0.224

Table 6: Predictors of personal accomplishment among residents of the Aseer region.

	Predictors	**Estimates**	**CI**	**p-value**
	(Intercept)	24.94	15.00 – 34.88	**<0.001**
How many hours of on call ?	9-16 hrs	Reference		
	17-24 hrs	6.42	-0.67 – 13.51	0.076
	9-16 hrs	1.27	-7.50 – 10.05	0.776
How many hours of post call?		Reference		
	1-2 hrs	12.64	5.36 – 19.93	**0.001**
	3-4 hrs	12.32	7.20 – 17.43	**<0.001**
	5-6 hrs	10.75	5.37 – 16.12	**<0.001**
	Over 6 hrs	4.35	-1.56 – 10.25	0.148
Residency	Dermatology	Reference		
	Emergency	4.00	-11.76 – 19.75	0.618
	ENT	-1.07	-7.14 – 5.00	0.729
	Family medicine	-21.94	-41.75 – -2.13	**0.030**
	Gynecology	-7.68	-13.23 – -2.13	**0.007**
	Internal Medicine	-3.09	-8.89 – 2.72	0.296
	Maxillofacial	12.69	-8.02 – 33.39	0.228
	Neurology	-18.26	-31.96 – -4.57	**0.009**
	Ophthalmology	3.11	-4.02 – 10.25	0.391
	Orthopaedic	-4.97	-11.95 – 2.02	0.163
	Pediatrics	-14.40	-19.96 – -8.83	**<0.001**
	Preventive medicine	-18.09	-38.15 – 1.96	0.077
	Psychiatry	-5.80	-11.04 – -0.56	**0.030**
	Radiology	-5.68	-11.70 – 0.34	0.064
	Surgery	-1.02	-7.20 – 5.15	0.744
Gender	Male	Reference		
	Female	-1.66	-4.25 – 0.93	0.208
Age group	24-26 years	Reference		
	27-29 years	1.63	-1.68 – 4.94	0.333
	Above 30 years	3.35	-2.54 – 9.23	0.264
Marital	Single	Reference		
status	Divorced	-3.08	-10.87 – 4.70	0.436
	Married	0.15	-2.84 – 3.15	0.919
Year of	R1	Reference		
residency	R2	-0.79	-4.20 – 2.62	0.649
	R3	2.22	-1.74 – 6.19	0.271
	R4	1.89	-2.58 – 6.37	0.405
	R5 or above	-8.63	-17.85 – 0.58	0.066

Discussion

This study illustrated burnout among Saudi residents in the Aseer region using a validated tool, the MBI-HSS, for medical personnel. EE subscale with mean score 34.13±0.66 reported in this study to be high in 72%,while DP with mean 12.81±0.35 reported high score in 68%, and PA with mean 34.13±0.96 reported high score in 37%. The burnout reported among physicians in developed countries, such as Switzerland, Italy, and France, ranged from 30 to 50%, likely because of high patient expectations and demands. [16] Meanwhile, the prevalence of burnout reported in developing countries was higher; Alenezi et al., 2021, a cross section held in Riyadh, reported a high EE of 57.51% and high DP of 36.62%.[17] Many Saudi Arabian studies have reported burnout rates between 25.2% and 70%. Bawakid et al. (2017) in Jeddah, KSA, reported lower subscale scores EE 69.5%, DP 26%, and PA 12.2%, but they used different cut-points for the subscales; however, the mean±SD was lower for each subscale EE, DP, and AP than in our study 11.60±4.70, 5.66±5.20, and 14.44±3.66, respectively.[12, 13, 17].

In this study, call hours of 17-24 hours increased EE significantly by 8.93(95%CI: 1.98- 15.87, p=0.012), and postcall hours of 1-2 hours decreased EE significantly -8.00 (95%CI:-15.14 - -0.86, p=0.028). The fifth year of residency had a significant effect on EE (p=0.002). Moreover, most residency programs increased EE significantly compared to others, except for dermatology, preventive medicine, and maxillofacial programs. The DP subscale increased significantly with on-call hours 17-24 hours 6.95(95%CI:2.55 – 11.34, P=0.002) and with some residency programs than with others, such as emergency, internal medicine, pediatrics, and surgery. For the AP subscale, our results illustrated that 1-6 post-call hours increased the AP score, lowered burnout, and some residency programs such as family medicine, gynecology, pediatrics, psychiatry, and neurology decreased the AP score, which increased the burnout subscale.

Aldubai et al. (2019) in Al Madina, KSA reported only for the EE subscale considering it as a good reflection of burnout, where the mean EE of residents was 22.5 ± 12.8, and only 32.0% showed high EE. [13] This could be explained by the higher number of residents in Jeddah than in Aseer, which could decrease the burden of on-call duties and burnout. Working in shifts (p = 0.026) and years of residence (p= 0.039) significantly increased EE.

Bawakid et al. (2017) reported that patient violence was a significant predictor of burnout among physicians 0.36(95%CI: 2.93 - 5.55, p<0.001).[12] Suffering from back pain (OR=2.1, 95%CI 1.2-3.8, p=0.01), sleep deprivation (OR=2.2, 95%CI 1.2-3.8, p=0.009), being a resident physician/surgeon (OR=4.9, 95% CI 1.7-14.2, p=0.004), and having a negative effect of practice on family life (OR=2.1, 95%CI 1.1- 3.9, p=0.02) were reported in Aldrees et al., while 2022 reported working more than 80 h/week (OR = 16.437; 95% CI:2.059–131.225), and being dissatisfied (OR = 22.28; 95% CI: 1.75–283.27) were significant predictors of burnout among residents in Canada.[10]

Increased on-call hours that result in sleep deprivation are associated with increased depression and burnout. Many theories explaining the link between sleep deprivation and burnout propose chronic energy depletion or activation of the hypothalamic- pituitary-adrenal axis, along with elevated levels of physical stress, as the underlying mechanisms.[18]

Shu Feng et al., in a cohort study of ophthalmology residents at University Washington, recommended mandatory post-call hours to improve post-call sleep and lower EE, DP, and PA [19].

Our findings regarding the mediation model illustrate the non-significant effect of satisfaction as a mediator of EE or DP. However, satisfaction significantly diluted the effect of on-call hours on AP through an indirect effect of 2.32 (95% CI 0.08 – 4.55, p=0.042), as when the PA subscale increased, burnout decreased. Zhang et al. (2021) highlighted the significant indirect effect of EE on satisfaction through both optimism and work engagement 0.03 (95%CI=0.01 0.05).[20]

This study has some limitations. First, this was a cross-sectional study that lacked causal inferences and directionality. Second, as satisfaction is measured by one aspect of job satisfaction, we recommend that future studies include different aspects of job performance and longitudinal studies. Finally, the medical history of residents was not included in this study, which could have affected the burnout subscales. However, this study had some strengths, to our knowledge, it was the first study in Aseer that evaluated burnout among residents and focused on specific call and post call hours. The first study used mediation analysis to assess the effect of satisfaction on burnout.

Conclusion

This study highlighted a high prevalence of burnout among Saudi residents in the Aseer region, emphasizing the need for greater attention to prevent its consequences. It recommends implementing mandatory post-call hours and limiting on-call shifts to no more than 16 hours to improve residents' quality of life and reduce burnout.

References:

1. Ishak WW, Lederer S, Mandili C, Nikravesh R, Seligman L, Vasa M, et al.. Burnout during residency training: a literature review. J Grad Med Educ. 2009 Dec;1(2):236-42. doi: 10.4300/JGME-D-09-00054.1.

2. McCray LW, Cronholm PF, Bogner HR, Gallo JJ, Neill RA. Resident physician burnout: is there hope?. Fam Med. 2008;40(9):626-632. doi: 10.22454/FamMed.2008.236219

3. Rodrigues H, Cobucci R, Oliveira A, João Cabral V, Medeiros L, Gurgel K. et al. Burnout syndrome among medical residents: A systematic review and meta-analysis. PLoS One. 2018;13(11):e0206840. doi:10.1371/journal.pone.0206840

4. Al-Dubai SA, Ganasegeran K, Perianayagam W, Rampal KG. Emotional burnout, perceived sources of job stress, professional fulfillment, and engagement among medical residents in Malaysia. Scientific World Journal. 2013; 2013:137620. doi:10.1155/2013/137620

5. Ashkar K, Romani M, Musharrafieh U, Chaaya M. Prevalence of burnout syndrome among medical residents: experience of a developing country. Postgrad Med J. 2010;86(1015):266-271. doi:10.1136/pgmj.2009.092106

6. Aldrees TM, Aleissa S, Zamakhshary M, Badri M, Sadat-Ali M. Physician well-being: prevalence of burnout and associated risk factors in a tertiary hospital, Riyadh, Saudi Arabia. Ann Saudi Med. 2013 Sep-Oct;33(5):451-6. doi: 10.5144/0256-4947.2013.451.

7. Abdo SA, El-Sallamy RM, El-Sherbiny AA, Kabbash IA. Burnout among physicians and nursing

staff working in the emergency hospital of Tanta University, Egypt. East Mediterr Health J. 2016;21(12):906-915. doi:10.26719/2015.21.12.906

8. Dawson D, Reid K. Fatigue, alcohol and performance impairment. Nature. 1997;388(6639):235. doi:10.1038/40775

9. Barger LK, Weaver MD, Sullivan JP, Qadri S, Landrigan CP, Czeisler CA. Impact of work schedules of senior resident physicians on patient and resident physician safety: nationwide, prospective cohort study. BMJ Med. 2023;2:e000320. doi:10.1136/bmjmed-2022-000320

10. Shalaby R, Oluwasina F, Eboreime E, El Gindi H, Agyapong B, Hrabok M, et al. Burnout among Residents: Prevalence and Predictors of Depersonalization, Emotional Exhaustion and Professional Unfulfillment among Resident Doctors in Canada. Int J Environ Res Public Health. 2023 Feb 19;20(4):3677. doi: 10.3390/ijerph20043677.

11. Papathanasiou IV. Work-related Mental Consequences: Implications of Burnout on Mental Health Status Among Health Care Providers. Acta Inform Med. 2015 Feb;23(1):22-8. doi: 10.5455/aim.2015.23.22-28.

12. Bawakid K, Abdulrashid O, Mandoura N, Shah HBU, Ibrahim A, Akkad NM, et al. Burnout of Physicians Working in Primary Health Care Centers under Ministry of Health Jeddah, Saudi Arabia. Cureus. 2017 Nov 25;9(11):e1877. doi: 10.7759/cureus.1877.

13. Aldubai SAR, Aljohani AM, Alghamdi AG, Alghamdi KS, Ganasegeran K, Yenbaawi AM. Prevalence and associated factors of burnout among family medicine residents in Al Madina, Saudi Arabia [published correction appears in J Family Med Prim Care. 2019 Mar;8(3):1293. doi: 10.4103/2249-4863.256944.]. J Family Med Prim Care. 2019;8(2):657-662. doi:10.4103/jfmpc.jfmpc_268_18

14. Shi, Y.; Gugiu, P.C.; Crowe, R.P.; Way, D.P. A Rasch Analysis Validation of the Maslach Burnout Inventory—Student Survey with Preclinical Medical Students. Teach. Learn. Med. 2019, 31, 154–169..

15. Thorsen VC, Tharp AL, Meguid T. High rates of burnout among maternal health staff at a referral hospital in Malawi: A cross-sectional study. BMC Nurs. 2011;10:9. Published 2011 May 23. doi:10.1186/1472-6955-10-9

16. Deckard G, Meterko M, Field D. Physician burnout: an examination of personal, professional, and organizational relationships. Med Care. 1994;32(7):745-754. doi:10.1097/00005650-199407000-00007

17. Karim Alenezi N, Hamad Alyami A, Omar Alrehaili B, Adnan Arruhaily A, Kareem Alenazi N, Abdo Radman Al-Dubai S. Prevalence and Associated Factors of Burnout Among Saudi Resident Doctors: A Multicenter Cross-Sectional Study. Alpha Psychiatry. 2022;23(4):173-183. doi:10.5152/alphapsychiatry.2022.21361

18. Stewart NH, Arora VM. The Impact of Sleep and Circadian Disorders on Physician Burnout. Chest. 2019;156(5):1022-1030. doi:10.1016/j.chest.2019.07.008

19. Feng S, Davis JA, Chowdhary A, Lomazow W, Yi JS., Huang J. et al. The effect of mandatory post-call relief on sleep and wellness in ophthalmology residents. BMC Med Educ. 2023;23(1):955.. doi:10.1186/s12909-023-04947-1

20. Zhang H, Chen D, Cui N, Zou P, Shao J, Wang X, et al. Explaining Job Satisfaction Among Residents in Standardized Residency Training

Programs: A Serial Multiple Mediation Model. Risk Manag Healthc Policy. 2021;14:4073-4081. https://doi.org/10.2147/RMHP.S330217

Citation: AlHefdhi HA, Mahmood SE, Alshumrani ZG, Alzailaie AK,.AL-Aslai SA, Alghamdi AM, et al. Relation of Burnout to On-Call Duties Among Saudi Broad Residents In Aseer Region: A Cross-Sectional Study. National Journal of Medical and Allied Sciences 2023; 12(2): 15-28

Conflicts of Interest: Nil Source of Funding: Nil

Date of Acceptance: 25-12-2023

Date of Submission: 02-11-2023