

A Prospective Interventional Study to Assess the Awareness of “Go Green” Initiatives among Healthcare Personnel in Tertiary Care Hospital, Nagpur

Sambli Gupta¹, Shivani Shahu¹, Nancy Nair², Nikhil Sagare¹

¹Department of Hospital Administration, School of Allied Health Sciences, Datta Meghe Medical College, Datta Meghe Institute of Higher Education and Research (DU), Nagpur, Maharashtra, India, ²Department of Clinical Embryology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research (DU), Wardha, Maharashtra, India

Abstract

Aim: The green hospital concept was established, which is a hospital that promotes public health by continuously reducing its environmental impact and ultimately eliminating its contribution to the burden of disease. Green hospitals aim to save energy, conserve resources, and be environmentally friendly. The focus is mainly on keeping people healthy, not just treating them when they are sick. The purpose of this study is to evaluate health professionals' awareness and understanding of the “Go Green Hospital Initiative” and to figure out the degree to which awareness of the “Go Green” initiative is related to baseline factors. **Methods:** This was a prospective study that was conducted at Datta Meghe medical college and its constituent Hospitals (Shalini Tai Meghe hospital and research Centre and Dr. Babasaheb Ambedkar Superspecialty Institute) from December 2023 to November 2024. The sampling technique used was simple random sampling using lottery method. The data were gathered from the healthcare professionals of the hospital using semi-structured questionnaires and training was provided to them through PowerPoint presentation. Pre- and posttest were taken, and the scores were compared using paired *t*-test. **Results:** Upon testing the knowledge and awareness of healthcare personnel, the data show the average score of pretest result is 4.6 ± 1.8 , while the same for posttest was 7.3 ± 2.2 , and thus, there was a mean improvement of 2.7 in the performance of study participants. The results of the study were analyzed by open Epi version 3.01. **Conclusion:** A systematic training is essential for improving healthcare staff's understanding and awareness of the Go Green Hospital Initiative. The significant increase in knowledge from pretest to posttest after the intervention demonstrates the effectiveness of educational activities that serve to promote sustainable behaviors in healthcare facilities. Healthcare organizations could move closer to becoming truly green by empowering employees with ongoing training on eco-friendly techniques.

Keywords: Awareness, ecological, health, hospital, sustainable, waste management

INTRODUCTION

A “green hospital” is a healthcare facility that emphasizes on sustainable building design and incorporates ecological considerations into its high-quality services. It needs elements such as a good location, effective water and energy use, acceptable air pollution, and high-quality materials.^[1] The United Nations Conference on Human Environment, which took place in Stockholm in 1972, was the first attempt in this direction. “The protection and improvement of the human environment is a major issue which affects the well-being of people and economic development throughout the world.”^[2] However, considerable environmental sustainability measures at the national and international

levels are essential for reducing the dangerous global emissions and bringing about an evolutionary improvement on a worldwide scale.^[3] The main causes of medical waste mismanagement are a lack of appropriate laws, financial

Address for correspondence: Dr. Shivani Shahu,
Department of Hospital Administration, School of Allied Health Sciences,
Datta Meghe Institute of Higher Education and Research (DU),
Wardha, Maharashtra, India.
E-mail: shivani.shahu@dmher.edu.in

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Gupta S, Shahu S, Nair N, Sagare N. A prospective interventional study to assess the awareness of “go green” initiatives among healthcare personnel in tertiary care hospital, Nagpur. *Int J Env Health Eng* 2025;14:28.

Received: 04-12-2024,

Revised: 07-05-2025,

Accepted: 13-05-2025,

Published: 29-07-2025

Access this article online

Quick Response Code:



Website:
<https://journals.lww.com/IJEH>

DOI:
10.4103/ijehe.ijehe_55_24

constraints, a shortage of trained medical staff, a lack of focus and ineffective management.^[4]

Health policy decision-makers must analyze systematically and take the lead on programs that focus on global environmental health for both the present and future generations of healthcare professionals and health-promoting activities.^[5]

Green healthcare acknowledges the relationship between environmental and human health and intends to minimize harmful environmental effects and eradicate diseases.^[6] Reducing carbon emissions is the main objective behind energy efficiency efforts.^[7] Organizations must reduce their carbon footprint directly and indirectly by influencing other members of society.^[8] Hospitals and healthcare systems that execute green initiatives obtain numerous benefits as their actions improve the public image of the organization, the environment, and the communities in which they serve.^[9] It will take much more than just turning off the lights and recycling to make future healthcare financially and environmentally sustainable.^[10]

The promotion of green building is a worldwide effort to improve the condition of the environment.^[11] From a worldwide perspective of resource management, waste and waste management education and awareness are becoming more and more significant. The survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, and the depletion of forests, soil, and water are all threatened by local, regional, and global air pollution, the buildup and dispersal of toxic wastes, the depletion of the ozone layer, and the release of “greenhouse” gases. People need to be educated on how to minimize or reduce waste in every way possible. People support the efforts of the municipal authority once they are informed about the effects of garbage in the environment and how to prevent and minimize it.^[12]

Research has shown that inhalational anesthetics are a major source of greenhouse gas emissions. Employing the “8 Rs” (rethink, refuse, reduce, reuse, recycle, research, renovation, and revolution) and educating patients and employees showed promise in reaching green hospital standards.^[13] In addition, by giving all populations equitable access to natural habitats and ecosystem services, green space can help minimize environmental and health discrepancies.^[14] If we built multifunctional, adaptable facilities for expanded primary care organizations, integrated community and social care workers, diagnostics, and specialist consultation, we might obtain better, affordable, and environmentally friendly health care.^[10] Green practices can be implemented in surgical units with considerable potential by the medical community. These procedures can have beneficial impacts on the environment and the medical community.^[15] Orthopedic surgeons and staff can immediately reduce the environmental impact of orthopedic procedures like anterior cruciate ligament reconstruction by using more reusable materials. Installing energy-efficient equipment and putting in place recycling initiatives are a couple of larger medical center changes that can significantly lessen their impact on the environment.^[16]

The green healthcare system directly and indirectly safeguards and advances health.^[17] Staff and patient experiences are known to be associated with green design elements such as leadership in energy and environmental design, green building design, environmental sustainability, natural environment, green space, indoor air quality, thermal comfort, acoustic comfort, waste management, and water conservation. The health of the workers and patients is positively impacted by green design features. Green design principles could therefore improve patient care and human health in hospitals.^[18]

Acknowledging the current gaps in the knowledge domain, the purpose of this study is to assess the awareness of health professionals’ understanding of the “Go Green Hospital Initiative.” The goal is to reduce the hospital’s impact on the environment by implementing environmentally friendly procedures and to corroborate the study findings with sociodemographic factors.

MATERIALS AND METHODS

This was a prospective type of study. The study was conducted at Datta Meghe Medical College and its constituent hospitals (Shalini Tai Meghe Hospital and Research Centre and Dr. Babasaheb Ambedkar Superspecialty Institute) from December 2023 to November 2024. The sampling technique used was simple random sampling using the lottery method. The data were gathered from the healthcare professionals of the hospital using questionnaires, and training was provided to them through PowerPoint presentations. Pre- and posttest conducted and the scores were compared using paired *t*-test.

The study includes nurses, paramedical staff, attendants, and managers, and the exclusion criteria for the study are doctors, allied health students, and nursing students. The study tool was the semi-structured questionnaire that was designed based on the data collected from similar studies, and it was administered to gather data from selected groups of healthcare personnel.^[5,8,11]

The sample size for the study was calculated using equation 1:

$$n = N/1+N (e^2) \quad (1)$$

Where, *n* = sample size, *N* = population size (number of total paramedical staff, nursing staff, class 4 attendants, and managers is 336), the sample size is taken from the Shalini Tai Meghe Hospital and Research Centre and Dr. Babasaheb Ambedkar Superspecialty Hospital, *e* = level of precision (0.05), and *n* = 182.6, so sample size is taken as, 183.

Study procedure

Before conducting the survey, the aims and objectives of the study proposal were sent to the institutional ethics committee, and approval was taken. Health professionals were informed about the study, and consent was taken prior to the study. Pre- and posttest was taken using Google Form questionnaire, and training was provided to the participants through PowerPoint presentation.

Statistical analysis

The data were analyzed using descriptive statistics based on frequency and percentage, and Inferential statistics using Paired *t*-test at $P < 0.05$. The data were analyzed using openEpi software version 3.01 (OpenEpi: Open-Source Epidemiologic Statistics for Public Health).

RESULTS

The study included 183 participants among whom 45.7% fall in (18–25) age group, 40.8% in (26–35) age group, 12% were between 36 and 45 years, and 1.6% were in 46–60 age category [Table 1]. The majority of participants were females (81.5%) and males were (18.5%).

Figure 1 is a pie chart showing the percentage of participants of various designations, nurses (70.70%), technicians (14.1%), attendants (5.40%), and administrative managers (9.80%).

Table 2 shows the comparative scores of participants in pre- and posttest results.

The mean \pm standard deviation for pretest was estimated as 4.6 ± 1.8 , while the same for posttest was 7.3 ± 2.2 , and thus, there was a mean improvement of 2.7 in the performance of study participants. On applying paired *t*-test, the result was found to be highly statistically significant ($P < 0.0001$). The study results were analyzed using openEpi software version 3.01. suggesting that there was a statistically significant improvement

in the awareness about “go-green initiative” among study participants.

DISCUSSION

Healthcare workers benefit from an eco-friendly environment by learning more and putting it into practice in their daily tasks. In the current study, the intervention was based on training and providing awareness about “Go-green” and how small steps can bring a big impact. A similar study by Dhillon *et al.* suggested that reduced “stand-by” energy use, renovating buildings to reduce energy waste, buying energy-efficient products, and switching to compact fluorescent and light-emitting diode light bulbs are all small steps that can make a big difference.^[2]

According to the current study’s findings [Tables 1, 2 and Figure 1], the majority of respondents (23 [%]) fit into the below-average category of knowledge and awareness about go green initiatives in pretest results. However, they have above-average results in posttest responses after their training session. A similar study conducted by Joseph in 2019 found that the majority of participants (54%) received an average score on the knowledge and awareness test, followed by 32% who scored a good score, and 13% scored a poor score. Only 0.5% scored above the average score. This reported lower awareness could be because only a few of them had prior knowledge of Go Green initiatives.^[5]

In the present study, the awareness and knowledge of healthcare staff have been enhanced through the training program, as a positive climate change can be encouraged by healthcare professionals. A similar study was conducted by Alkaabi and Aljaradin in 2022 explained that building materials and supplies, adopting an ecologically friendly attitude while building a hospital, and continuing to do so while producing services. This strategy is based on environmental management skills in a number of fields, such as creative environmental designs, waste and hazardous material management, water management, energy management, and emission control systems.^[11]

According to the study’s findings, environment-friendly procedures contribute to a healthier workplace by reducing exposure to pollutants and enhancing the general health of staff members and patients. A similar study conducted by Allen *et al.* reported a 19% decrease in mortality in green hospital design. A drop in employee turnover, a reduction in the duration of available staff positions, and an increase in employee tenure all indicated that workers were generally satisfied with the newer facilities. Bloodstream infection rates lowered 70%, and the number of alterations to the Medication Administration Record decreased 49%, indicating an improvement in the quality of care in the new facility.^[19]

The substantial increase in posttest scores (mean increase of 2.7, $P < 0.0001$) demonstrates the potential for change through training programs. These interventions not only increase awareness but also give healthcare professionals the tools

Table 1: Sociodemographic attributes of study participant

	<i>n</i> (%)
Age group (years)	
18–25	84 (45.7)
26–35	75 (40.8)
36–45	22 (12)
46–60	3 (1.6)
Gender	
Males	34 (18.5)
Females	150 (81.5)

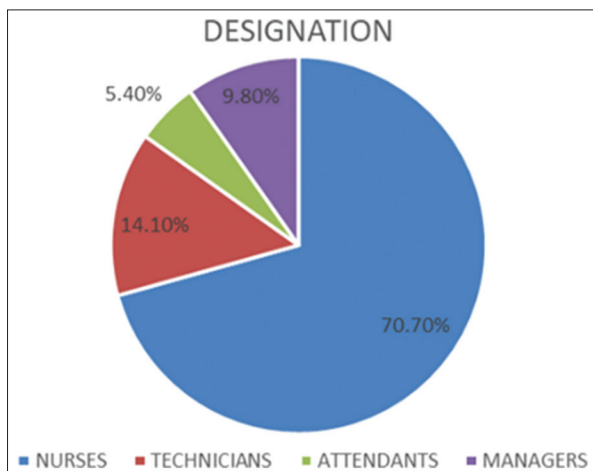


Figure 1: Participants of the study

Table 2: Questionnaire administered to the participants (sample size=183)

Questions	Number of correct responses (pretest)	Number of correct responses (posttest)
Percentage of energy consumption occurs by lighting, water heating, cooling, and ventilation (correct answer: 65%)	59	121
As per the Indian public health standard, energy consumption in the healthcare facility per bed per day (correct answer: 3 KW)	72	147
Strategies used by hospital for optimum usage of conservation of energy (correct answer: Switch off policy, regular walk rounds, maintenance)	118	134
Energy-efficient equipment and devices purchased by the hospital (correct answer: LED lights, occupancy sensors, refrigeration equipment, energy-saving equipment)	123	133
Percentage of electricity cut down and reduction of electricity consumption by installing solar panels (correct answer: 15%–20%)	60	110
Awareness of dual flush system in restrooms (correct answer: Yes)	139	169
Water flushed from larger lever and smaller lever of dual flush system (correct answer: 6–9 L and 3–4.5 L, respectively)	61	133
3Rs of waste management (correct answer: Reduce, reuse, recycle)	139	164
Frequency by which energy audit conducted in a hospital (correct answer: Biannually)	41	85
Products which is most difficult to recycle (correct answer: Polyvinyl chloride)	52	135

LED: Light-emitting diode

they need to implement in various sustainability-promoting activities. A similar study conducted by Ketabi *et al.* I reported that healthcare workers benefited from the educational intervention, which improved their attitudes and increased their understanding of the significance of managing hazardous waste in the home. Given that improving the household hazardous waste management system requires improved public awareness and attitude in conjunction with efficient communication between citizens, healthcare professionals, and Behvarzes (Iranian healthcare workers), city managers can utilize the approach used in this study to plan frequent training sessions on household hazardous waste management.^[20]

The study had a few limitations, one of them being targeted toward a smaller group of individuals working in tertiary care hospital which has restricted the sample size of the study and was devoid of generalization to the larger population. The study focused only on trained healthcare professionals which may not give the experience of all the staff working in a hospital.

It is recommended that healthcare organizations use an organized and continuous approach to educating healthcare personnel. To ensure that all healthcare employees, including supporting and administrative staff, are aware of sustainable practices and their significance, regular training programs must be established. In addition, including green practices in standard operating procedures and hospital regulations can promote long-term adherence and accountability. Hospitals maintain the continuity and advancement by establishing sustainability committees to oversee and direct green initiatives, prioritize investments in eco-friendly infrastructure and energy-efficient technologies, such as solar panels and water-saving devices. Cost-effectiveness should be assessed based on long-term savings and environmental advantages. Establishing consistent

monitoring, feedback systems, and benchmarking against accepted green healthcare standards would encourage continuous improvement.

CONCLUSION

The results of this study demonstrate the important role of healthcare professional training in raising knowledge about the “Go Green Hospital Initiative.” The participants’ pretest results showed that they understood very little about sustainability and eco-friendly practices in healthcare settings before the intervention. However, participants’ posttest results showed a noticeable increase following a systematic training session that covered topics including waste management, water efficiency, and energy saving. The significance of incorporating sustainability into healthcare procedures is also emphasized by the study. Although the sample size and demographic focus for this study were limited, still it offers a helpful starting point for more extensive research in the future. The quality of care provided and ecological results can both be improved systemically by encouraging an environment of sustainability among healthcare professionals.

Acknowledgments

We have received outstanding direction from the MHA faculty, the School of Allied Health Sciences, and the Datta Meghe Institute of Higher Education and Research Centre.

Financial support and sponsorship

Nil.

Ethics code

SMHRC/IEC/2023/1118.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

Sambli Gupta: Conception or design of the work, drafting of the work, approval of the final version of the manuscript, and agreed on all aspects of the work; Shivani Shahu: Literature review, revision of the manuscript for important intellectual content, approval of the final version of the manuscript; Nancy Nair: Literature review, revising the manuscript, approval of the final version of the manuscript; Nikhil Sagare: Review and revision of the manuscript for important intellectual content.

REFERENCES

- Iihmr_Admin. Green Hospitals: Sustainable Practices for the Future of Health; 2024. Available from: <https://iihmrdelhi.edu.in/blog/green-hospitals-sustainable-practices-for-the-future-of-health/>. [Last accessed on 2025 Apr 21].
- Dhillon VS, Kaur D. Green hospital and climate change: Their interrelationship and the way forward. *J Clin Diagn Res* 2015;9:E01-5.
- Bano V, Amin E, Maqbool S, Hassan SA, Baber A, Urooj R. Awareness of the green dentistry concept among dental professionals in tertiary care dental hospital, Rawalpindi. *Life Sci* 2024;5:251-8.
- Nafez AH, Ebrahimi A, Nejad MH, Bina B. Quantity and composition of produced dental solid waste in Isfahan, 2011. *Int J Environ Health Engi* 2014;3:17. Available from: <https://www.bing.com/search?q=2-%09Nafez+AH%2C+Ebrahimi+A%2C+Nejad+MH%2C+Bina+B.+Q+quantity+and+composition+of+produced+dental+solid+waste+in+Isfahan%2C+2011.+International+Journal+of+Environmental+Health+Engineering.+2014+Jan+1%3B3%281%29%3A17.&form=ANNTH1&refig=e826bde73009495581238b96a5a21fad&pc=DCTS>. [Last accessed on 2025 Apr 15].
- Joseph JM. Study on awareness of “go green hospital initiative” among healthcare personnel with a view to prepare an informational leaflet. *J Public Health Policy Plann* 2019;3:1-4.
- Lee SM, Lee D. Developing green healthcare activities in the total quality management framework. *Int J Environ Res Public Health* 2022;19:6504.
- Hossain MM, Georges JP, Rondeau E, Divoux T. Energy, carbon and renewable energy: Candidate metrics for green-aware routing? *Sensors (Basel)* 2019;19:2901.
- Bharara T, Gur R, Duggal SD, Jena P, Khatri S, Sharma P. Green hospital initiative by a North Delhi tertiary care hospital: Current scenario and future prospects. *Clin Diagn Res* 2018;12:DC10-4. Available from: https://jcdmr.net/article_fulltext.asp?issn=0973-709x&year=2018&volume=12&issue=7&page=DC10&issn=0973-709x&id=11758. [Last accessed on 2024 Jun 6].
- Borges De Oliveira K, De Oliveira OJ. Making Hospitals Sustainable: Towards Greener, Fairer and More Prosperous Services. *Sustainability* 2022;14:9730.
- Tomson C. Reducing the carbon footprint of hospital-based care. *Future Hosp J* 2015;2:57-62.
- Alkaabi A, Aljaradin M. Green hospitals for the future of healthcare: A review. *Al Kitab J Pure Sci* 2023;6:31-46.
- Kumar Verma A. Conservation status of amniotes found in and around Balapur Pond of District Prayagraj (Uttar Pradesh), India. *Int J Biol Res* 2020;8:1-5.
- Asamoto S, Sawada H, Muto J, Arai T, Kawamata T. Green hospital as a new standard in Japan: How far can neurosurgery go in Japan? *World Neurosurg* 2024;187:150-5.
- (PDF) Effects of Urban Green Space on Environmental Health, Equity and Resilience In: ResearchGate; 2024. Available from: https://www.researchgate.net/publication/319420917_Effects_of_Urban_Green_Space_on_Environmental_Health_Equity_and_Resilience. [Last accessed on 2025 Apr 17].
- Kwakye G, Brat GA, Makary MA. Green surgical practices for health care. *Arch Surg* 2011;146:131-6.
- Silva de Souza Lima Cano N, Engler ID, Mohammadizazi R, Geremica F, Lawson D, Drain N, *et al.* How can the environmental impact of orthopaedic surgery be measured and reduced? Using anterior cruciate ligament reconstruction as a test case. *Clin Orthop Relat Res* 2025;483:7-19.
- Green Healthcare System: Main Features in Supporting Sustainability of Healthcare System – A Review | SpringerLink. Available from: https://link.springer.com/chapter/10.1007/978-3-030-30841-4_8. [Last accessed on 2025 Apr 21].
- Khairunnisa RA, Setyonugroho W, Ulfa M. Green hospital implementation in health aspects: A systematic review. *UIJRT* 2022;46-58.
- Allen JG, MacNaughton P, Laurent JG, Flanigan SS, Eitland ES, Spengler JD. Green buildings and health. *Curr Environ Health Rep* 2015;2:250-8.
- Ketabi MH, Mohammadi F, Nafez A, Asari N. Investigating the effect of educational intervention on the awareness and attitude of health workers (Behvarzes) and health care workers of Ardestan city about household hazardous waste management. *Iran J Health Environ* 2024;17:279-300.