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The mediating role of health anxiety, resilience, and body image in the relationship between pain and sleep in hematopoietic stem cell transplantation patients

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Abstract

Introduction Bio-psychological factors may affect the relationship between pain and sleep, but they are understudied in hematopoietic stem cell transplantation (HSCT) patients. This study investigated the mediating role of health anxiety, resilience, and body image in the relationship between pain and sleep in HSCT patients.

Methods In this cross-sectional study, 210 HSCT patients from Motahari clinic, Shiraz University of Medical Sciences were recruited using convenience sampling. Demographic and clinical characteristics, Pittsburgh Sleep Quality Index, Numeric Rating Scale of Pain, Health Anxiety Inventory, Body Image Scale, and Connor-Davidson's Resilience were used. Data were analyzed using SPSS Macro process and structural equation model.

Results Approximately half of the participants reported good sleep quality. Mean resilience and health anxiety scores were 66.02 (SD = 14.85), 23.88 (SD = 10.30), respectively, indicating moderate levels. The mean of body image (5.90; SD = 4.26) indicated low negative body image. Sleep was correlated with pain ($r = 0.31$, $p < 0.001$), resilience ($r = -0.39$, $p < 0.001$), health anxiety ($r = 0.45$, $p < 0.001$), and body image ($r = 0.42$, $p < 0.001$). Poorer sleep was associated with higher pain, health anxiety, body image concerns, and lower resilience. Resilience (β = 0.16, CI = 0.03 to 0.31), health anxiety (β = 0.17, CI = 0.04 to 0.32), and body image (β = 0.25, CI = 0.10 to 0.43) mediated the pain-sleep relationship, explaining 31% of the total effect.

Conclusion Poorer sleep quality was associated with higher pain, health anxiety, lower resilience, and negative body image. These factors mediated the pain-sleep relationship in HSCT patients, highlighting the need for nursing interventions targeting resilience, body image, and health anxiety to improve pain and sleep outcomes.

Keywords Anxiety, Hematopoietic stem cell transplantation, Resilience, Sleep

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Future research may benefit from including a broader range of psychological factors—such as differences related to gender and individuals' prior experiences with pain—to deepen insight into the complexities of pain perception within clinical environments [11, 12]. Another limitation of this study lies in the potential constraints of the sample. While including 210 patients provides a solid foundation, the sample may not fully represent the broader population, especially if key demographic characteristics are not adequately controlled. Additionally, the absence of potentially influential factors—such as the levels of social support or presence of comorbid conditions—may have introduced confounding effects that were not considered. Lastly, the study does not address the long-term psychological or physical outcomes associated with the variables examined, leaving uncertainty regarding the predictive relevance of the findings over time. Furthermore, future longitudinal studies are recommended to clarify the temporal relationships between pain, sleep quality, and psychological factors in HSCT patients. Since peer support improved hope in chronic disease [58], and this study did not examine additional potential mediators or moderators, such as social support, hope and coping strategies, which may influence the relationship between pain and sleep. Future research should consider these factors to provide a more comprehensive understanding of this relationship.

While this study relied on self-reported data, which carries a risk of common method bias, several precautions were implemented to minimize its impact. Anonymous participation was ensured to encourage candid responses, and scale formats were diversified to reduce patterned answering. Nevertheless, the cross-sectional design means some shared variance may persist due to measurement methodology rather than true relationships. Future research could strengthen the findings by incorporating objective measures or temporal separation between the predictor and outcome assessments.

Conclusion

This study showed that there was a direct relationship between sleep quality and severity of pain, resilience, health anxiety, and body image in HSCT patients. Moreover, resilience played a mediating role in the relationship between severity of pain and sleep quality. Moreover, health anxiety mediated the relationship between the severity of pain and sleep quality in HSCT patients. In addition, a pathway through body image mediated the association between HSCT sleep quality and severity of pain. These findings highlight the importance of considering psychological and physical factors when addressing sleep quality in HSCT patients. Performing interventions aiming at reducing pain and health anxiety, as well as enhancing body image and resilience, may potentially contribute to better sleep outcomes; however, longitudinal or experimental studies are needed to confirm these relationships.

Abbreviations

HSCT	Hematopoietic stem cell transplantation
PSQI	Pittsburgh Sleep Quality Index
CD-RISC	Connor-Davidson's Resilience Scale
HAI	Health Anxiety Inventory
GVHD	Graft Versus Host Disease

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Author contributions

Masoume Rambod, Nilofar Pasyar, Bahman Mokhtarinia, Mani Ramzi, Mahdi Salmanpour participated in the conceptualization of this study. Bahman Mokhtarinia participated in the management of the data collection. Masoume Rambod and Mahdi Salmanpour managed the data analysis. All authors participated in writing and approving the original draft of the manuscript.

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Data availability

The data of this study will be available by email to Masoume Rambod.

Declarations

Ethical approval and consent to participate

This study was approved by the Research Ethics Committees of Schools of Nursing and Midwifery, Management and Medical Information Science, Shiraz University of Medical Sciences (IR.SUMS.NUMIMG.REC.1402.069, approval date: 2023-09-09). It was conducted based on the Declaration of Helsinki. The data collection on the HSCT patients was conducted anonymously. The written consent form to participate in this study was obtained from the HSCT patients. All the HSCT patients who participated in this study signed the written consent form. We confirm that this written consent form was informed.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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