ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Impact of Body Mass Index (BMI) on Mental Health of Firefighters

Mohammed Ahmed Mohammed Al Shehhi, Meet Panchal, M Shahnawaz Khan, Amal S George, Sivi Varghese, Muhammad Yasir

Department of Fire Safety Engineering and Management, International College of Engineering & Management, Muscat, Sultanate of Oman

Email: meet@icem.edu.om

ORCID: 0009-0005-9751-5653

Abstract

Firefighting is a career characterized by significant physical effort and continuous psychological challenges. This study qualitatively examines a link between Body Mass Index (BMI) and mental health among firefighters, emphasizing how body composition may affect psychological stability and job efficiency. A total of 37 firefighters, with an average of 9 years of experience, took part in the survey using a questionnaire exploring the connection between BMI and workplace mental well-being. Findings revealed that 65% of the participants were overweight or obese, 27% reported mental or emotional difficulties, and 19% experienced anxiety or depression symptoms in the previous year. Sleep problems were frequent, with 38% mentioning poor or insufficient rest, along with recurring emotional fatigue and mood changes. Although most participants remained calm during emergencies, hidden stress and unhealthy coping behaviors, such as smoking, were noted. Implementing supportive strategies can enhance resilience, promote overall wellness, and improve operational readiness, ensuring a healthier and more efficient firefighting workforce.

Keywords: Body Mass Index (BMI), Firefighters, Mental Health, Occupational Health, Psychological Well-being

1. Introduction

Firefighters face intense physical and psychological stress in their work, leading to high levels of trauma and mental strain. It is essential to comprehend how Body Mass Index (BMI) affects their mental health to promote awareness and resilience. Increased BMI can worsen mental health conditions like anxiety, depression, and post-traumatic stress disorder (PTSD), influencing work performance and overall well-being [IFSTA (2007)]. Examining this connection improves understanding of firefighters' health requirements and enhances adaptability and efficiency in protecting communities [NFPA (2022)]. Understanding the relationship between BMI and mental health can aid in stress management, enhance job performance, and promote a healthier and safer work environment.

1.1 Body Mass Index (BMI)

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

The Body Mass Index (BMI) is a simple and inexpensive tool for assessing whether an individual's weight is healthy for their height. It helps identify underweight, overweight, and obesity-related health issues and is widely used in research to classify populations [Nuttall, F.Q. (2015)]. The BMI is calculated by dividing weight in kilograms by the square of height in meters [Stensland, S.H., and Margolis, S. (1990)].

$$BMI = \left(\frac{Wight\ (kg)}{(Hight(m)^2)}\right)$$ [Stensland, S.H., and Margolis, S. (1990)]

According to the World Health Organization (WHO), BMI is categorized as underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (>30 kg/m²) [Lim, J.U. et.al. (2017)].

1.2 Mental Health

Mental health is a key part of public health and is defined as a state of well-being that enables people to function effectively. Mental illness includes conditions such as anxiety, depression, bipolar disorder, schizophrenia, and stigma, which affect one's ability to work or interact normally [Manwell, L.A. (2015)]. Influencing factors include psychological, biological, and social elements like family, poverty, and environment. Mental and physical health are closely linked; regular exercise, sufficient sleep, and social engagement help protect against mental illnesses [Bhugra, D., Till, A., and Sartorius, N. (2013)].

1.3 Importance of Mental Health to Firefighters

Due to exposure to traumatic events, injuries, and deaths, firefighters face high psychological demands. They are vulnerable to PTSD, fatigue, anxiety, and substance abuse [Harvey, S.B. (2016)]. Untreated mental issues may lead to poor decision-making or suicide [Bonita, I., Halabicky, O.M., and Liu, J. (2024)]. Promoting psychological training, guidance, and adaptability is vital to maintaining firefighters' performance and safety. Organizations have emphasized mental health resources to reduce stigma, enhance awareness, and encourage help-seeking. Building a culture of dialogue within fire services helps reduce burnout and suicide risks [Johnson, C.C. (2020)].

1.4 Firefighters' Duties

Firefighting involves protecting lives and property from fire and responding to medical emergencies, rescues, and hazardous materials [Gonzalez, D.E. (2024)]. Firefighters face risks such as smoke, heat, stress, and toxic exposure, which can cause chronic diseases or death [Kales, S.N. et.al. (2007)]. Their work requires physical strength, endurance, and long hours in protective gear, carrying victims, and handling equipment. Psychological strain from witnessing injuries and deaths, combined with irregular schedules and sudden alarms, contributes to fatigue and heart issues [Kales, S.N. et. Al. (2003)].

1.5 Impact of BMI and Mental Health on Firefighting and Rescue Operations

BMI and mental health significantly affect firefighters' performance. High BMI and obesity reduce flexibility, endurance, and cardiovascular health, limiting the ability to perform demanding tasks [Ras, J. (14)]. Obesity is more common among firefighters than in the general population, worsening health conditions like heart disease and nerve damage [Bucala, M., and Sweet, E. (2019)]. Mental challenges such as stress, depression, anxiety, and PTSD also impair focus and increase errors [Jahnke, S.A. et. al. (2016)]. Additional stressors like sleep deprivation, long shifts, and continuous exposure to danger further exhaust them physically and mentally [Aisbett, B. et. al. (2012)].

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Encouraging physical activity, healthy diets, and mental support, such as counselling and resilience training, helps maintain long-term physical and mental strength.

1. Methodology

This study aims to explore the possible relationship between BMI and mental health in firefighters, and how both can affect their daily life and work. Firefighting is a hard job, and we want to know if things like body weight and stress are related. This can help develop better support systems for them in the future.

To collect data, a simple but comprehensive questionnaire was created after reviewing other research and getting ideas from professionals. The questions were designed to examine both BMI and mental health together. The first part asked about age, weight, height, and work duties, while the second part focused on mental health, including feelings of stress, sadness, or worry, as well as sleep quality, exercise, and eating habits. These factors help identify what may influence the link between BMI and mental health.

Some questions were made to connect issues, such as sleep problems with stress, or high BMI with low fitness, to provide deeper understanding. The survey was conducted after firefighters' training sessions when they were relaxed and available. It took about 5 to 10 minutes, was easy to complete, and ensured confidentiality with no personal information shared.

BMI was calculated by dividing weight in kilograms by height in meters squared $BMI = \frac{weight}{height^2}$. After data collection, BMI results were compared with mental health responses to find patterns related to stress, fatigue, or sleep problems. The findings will help improve future programs that support both the body and mind of firefighters.

2. Results and Discussion

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

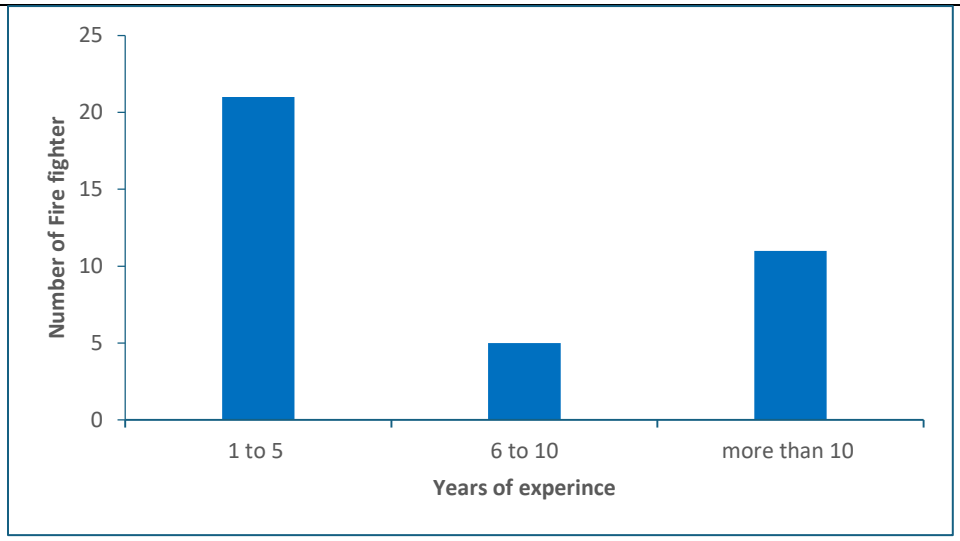


Figure 1: Categorisation of firefighters based on work experience

As shown in figure 1, A total of 37 firefighters took part in the survey. They had different levels of experience. Most of them (about 57%) had worked for 1 to 5 years. Then, 30% were more than 10 years, and the rest (13%) had between 6 and 10 years. So, we got views from both new and experienced firefighters, which gave us a better understanding.

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

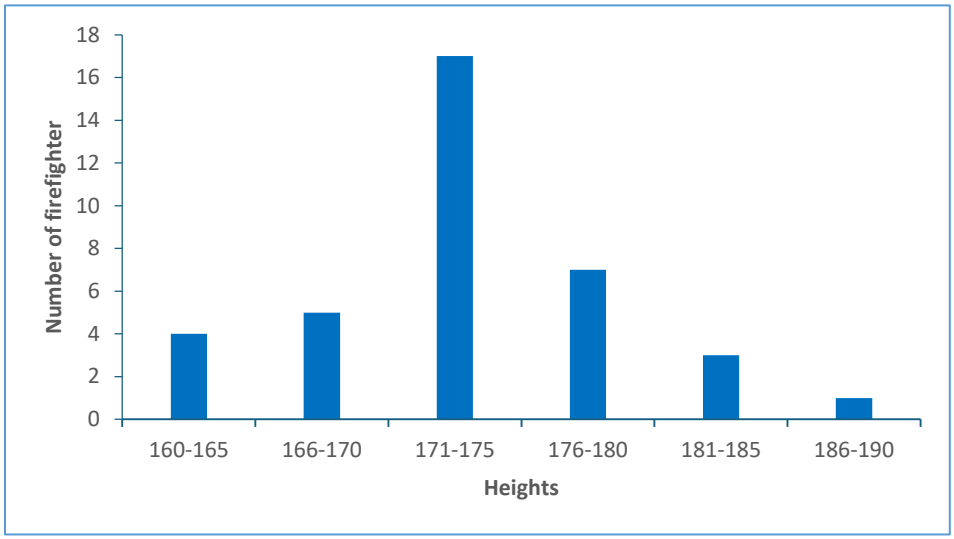


Figure 2: Categorisation of firefighters based on height

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

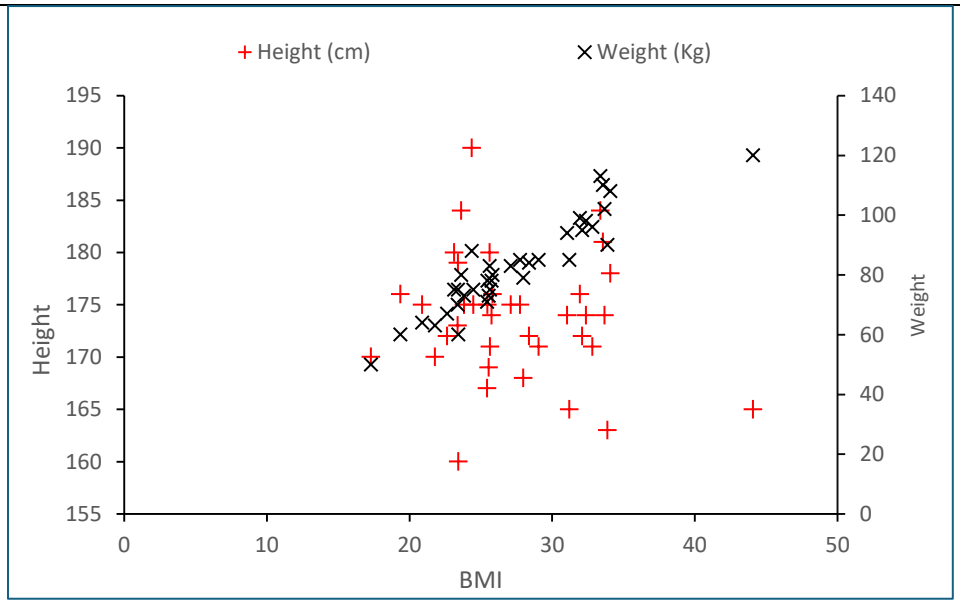
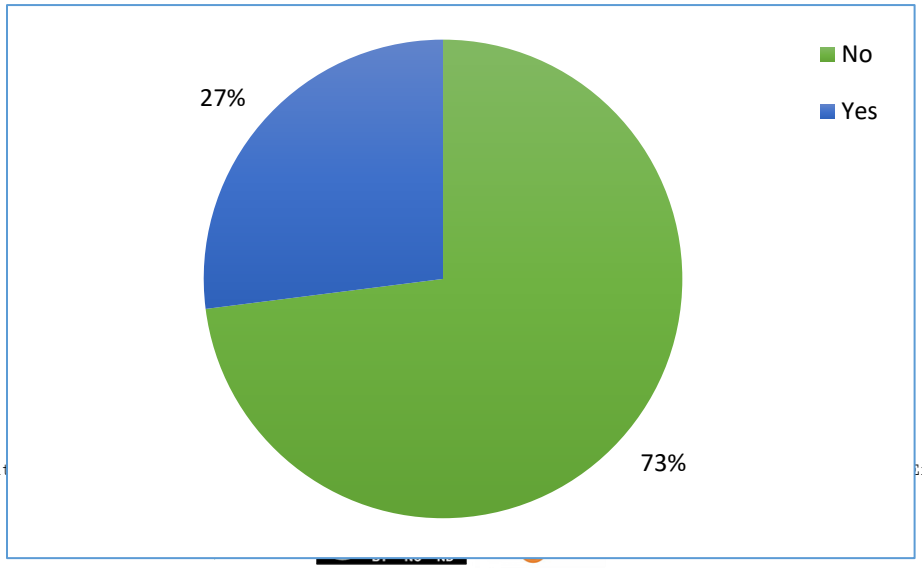


Figure 3: Distribution of height and weight of each personnel with reference to BMI

Figure 2 indicated that Most firefighters were between 171–175 cm tall, with only one reaching 186–190 cm. Height and weight were plotted against BMI, showing most values between BMI 23–34. Figure 3 shows that, heights were consistent, but weights varied, showing that weight significantly affects BMI. Using the WHO classification, 2.7% were underweight, 32.4% normal, 32.4% overweight, and 32.4% obese. The balanced distribution allowed a fair comparison.



ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 4: Ratio of physical challenges faced by the personnel at work.

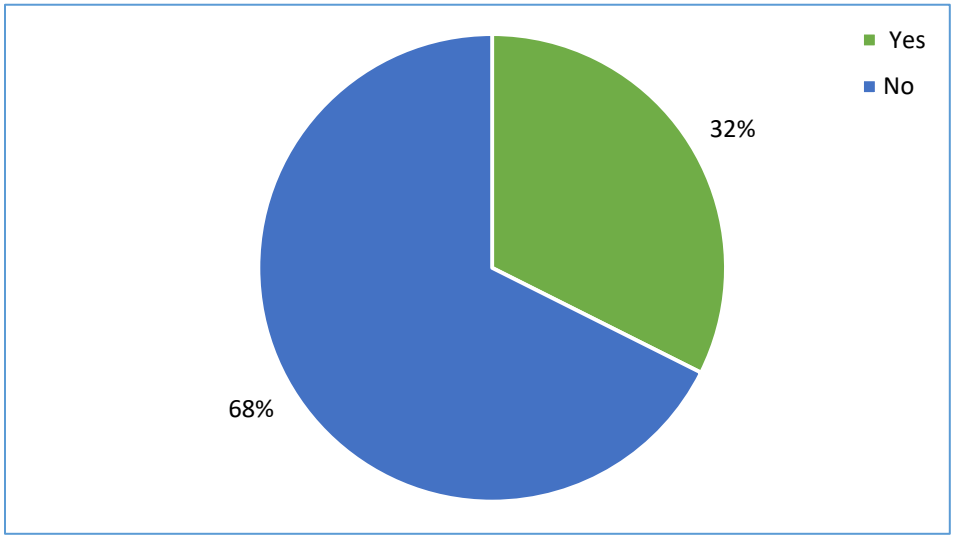
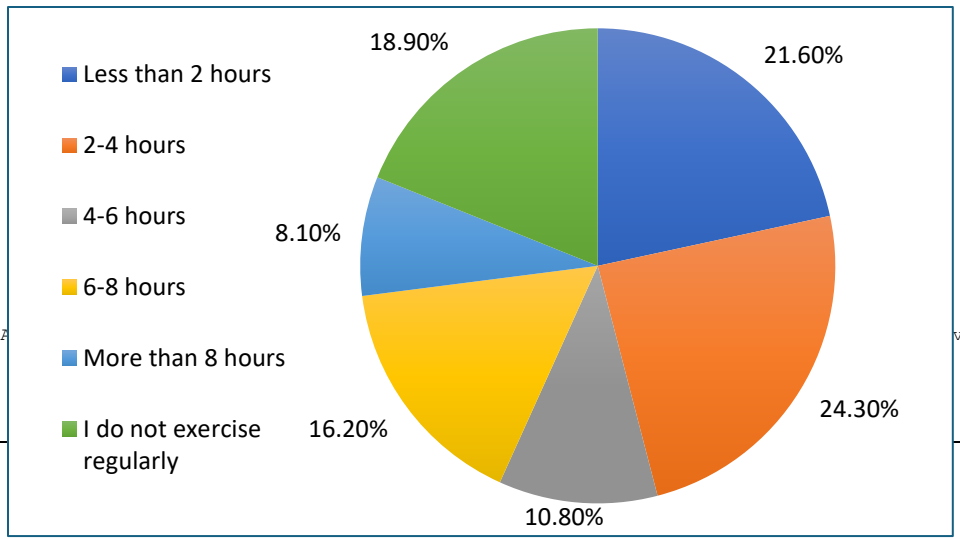


Figure 5: Mental issues/stress faced by the firefighters during emergency response

As you can see in figure 4, About 27% of participants reported experiencing health problems that made their daily life or work difficult. Figure 5 indicated that About 32% reported feeling tired or short of breath while working, as shown in. This indicates that their ability to remain active without fatigue or shortness of breath is not as strong as

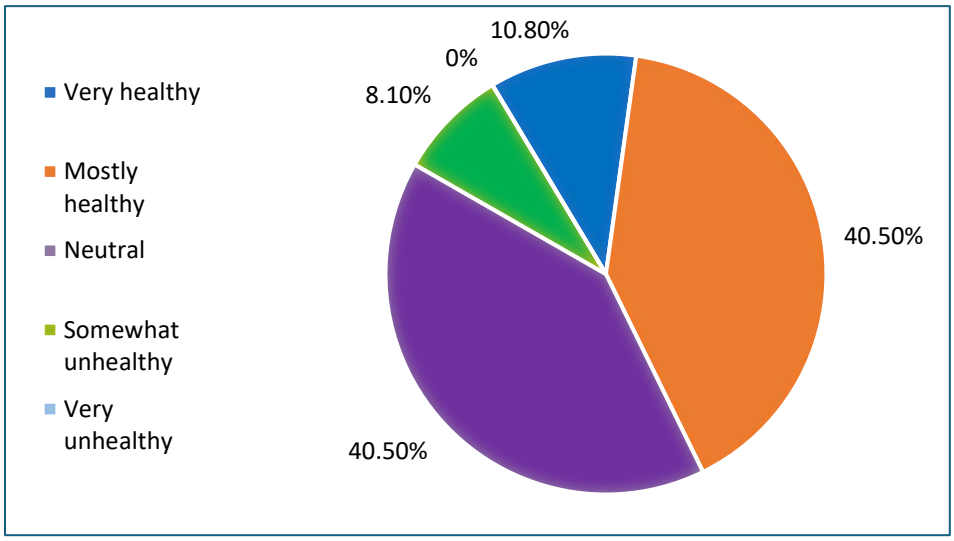


ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

it should be.

*Figure 6: Average time spent in a day by the firefighters on physical ac*tivities



ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 7: Self-opinion on personal eating habits or diet

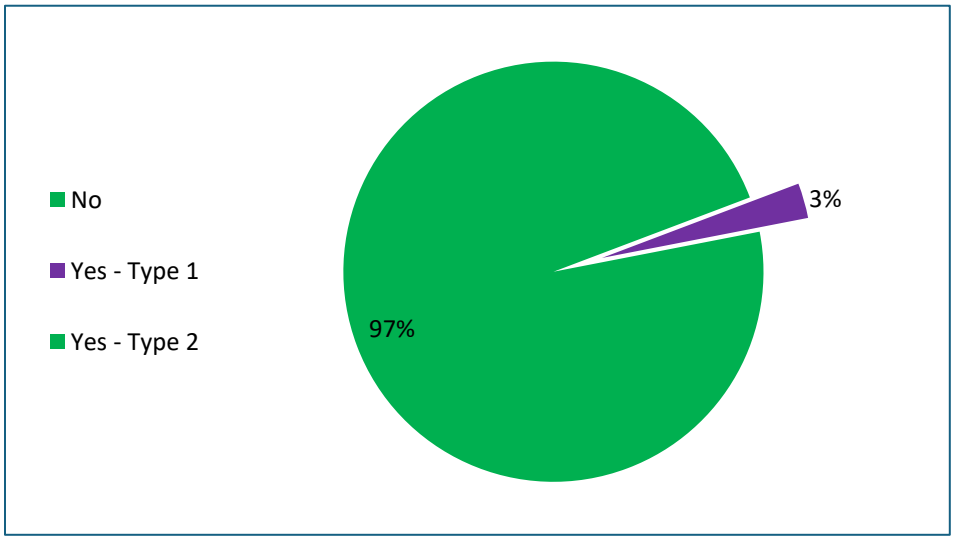


Figure 8: Ratio of the firefighters suffering with high blood sugar (diabetes)

As shown in figure 6, only 8% exercised more than 8 hours weekly, 19% didn't exercise at all, and most did 2–8 hours, insufficient for firefighters. Figure 7 shows that, regarding diet, 40% described theirs as mostly healthy, 41% as neutral, 11% very healthy, and 8% not very healthy. No one reported a very unhealthy diet, but continued screening is essential for overweight individuals. As you can see in figure 8 One participant (2.7%) had type 1 diabetes; none had type 2 but continued screening is essential for overweight individuals. While this is reassuring, regular monitoring and ongoing screening are necessary, especially for those who are overweight.

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

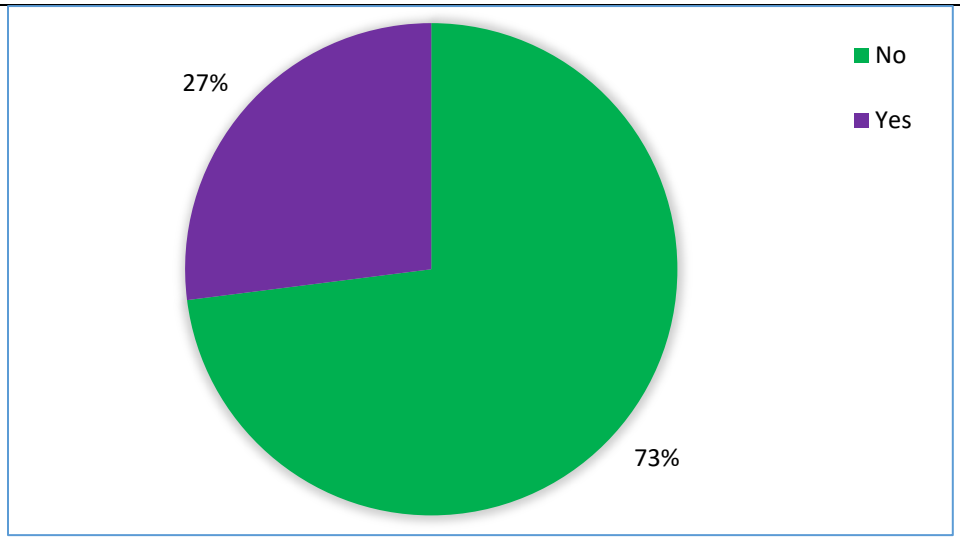
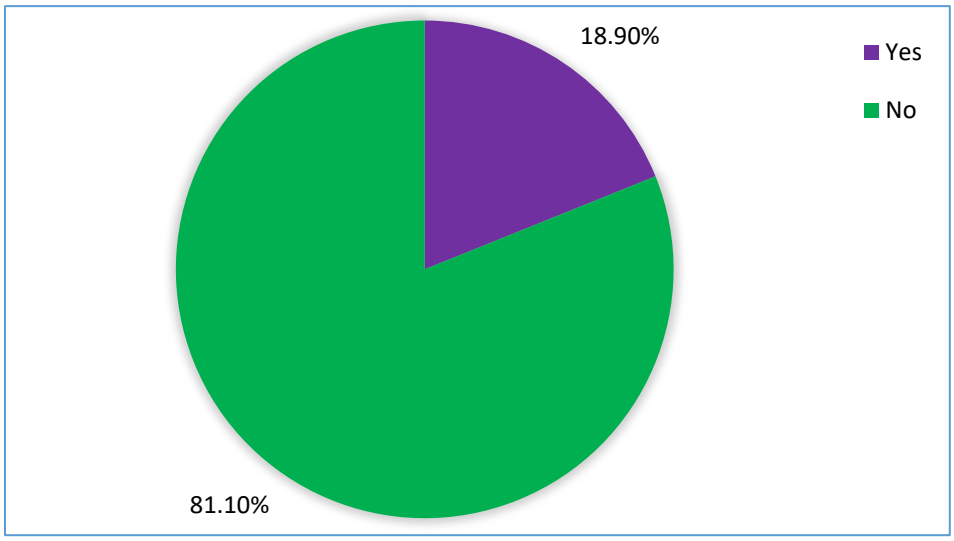


Figure 9: Ratio of mental or emotional challenges faced by firefighters



ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 10: Ratio of firefighters faced anxiety or depression in the past year

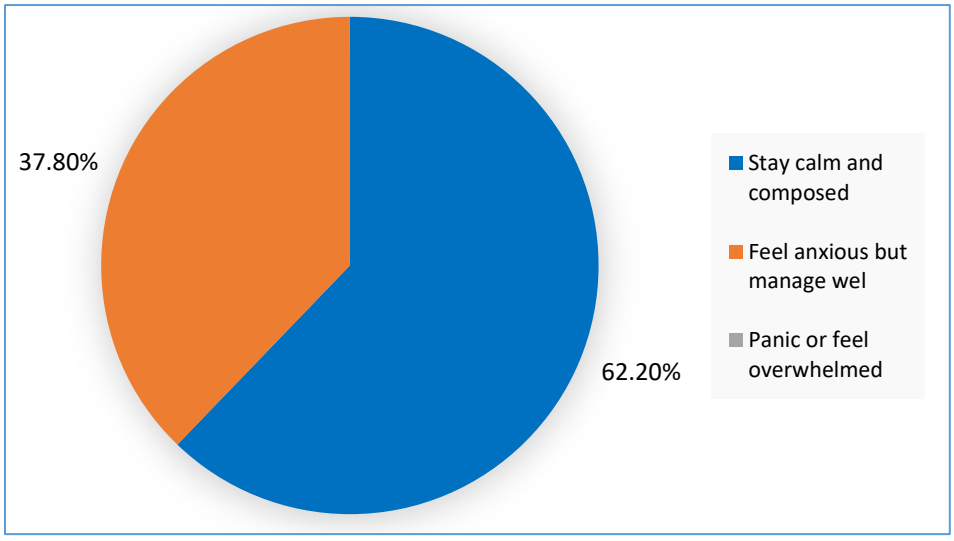


Figure 11: Responses of firefighters to challenging situations

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

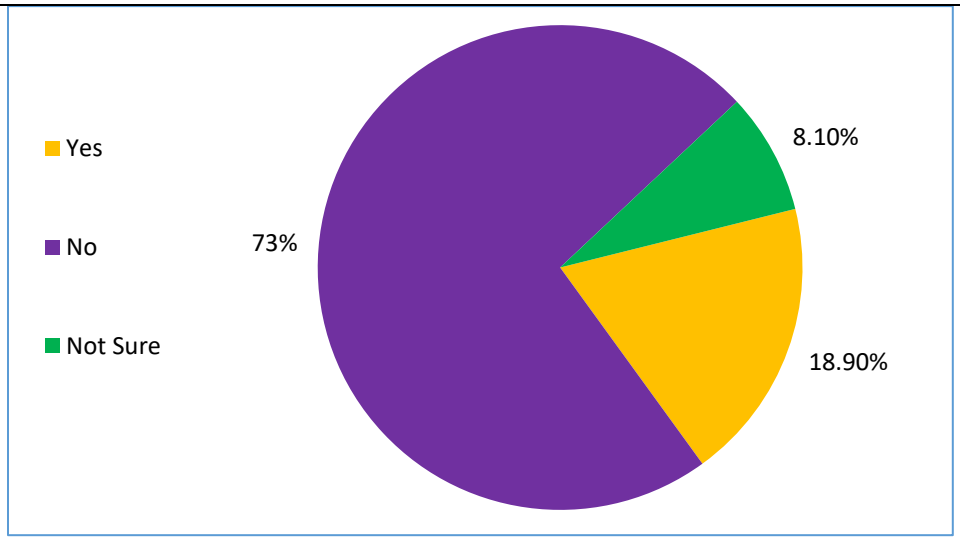
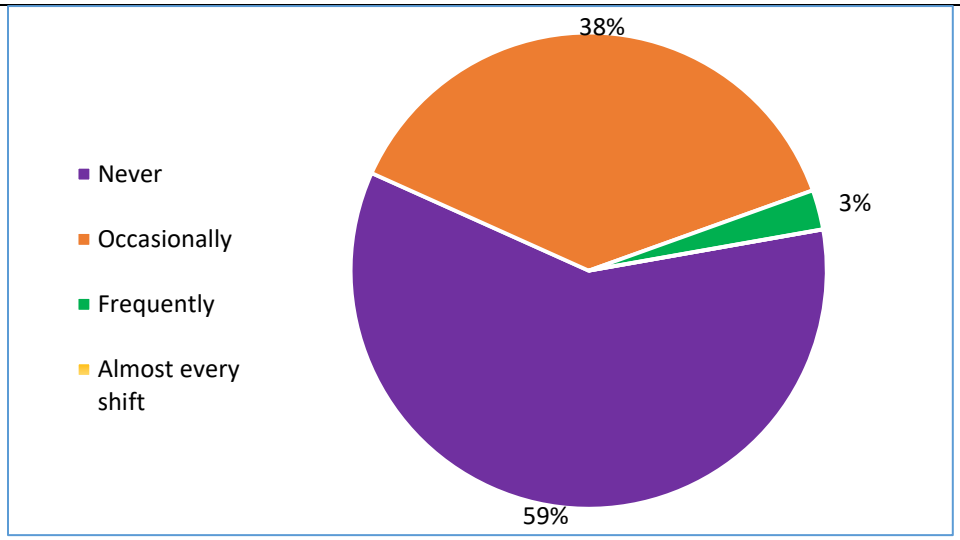


Figure 12: Opinion of firefighters whether weight impacts physical or mental stress

Figure 9 shows that 27% said they experienced psychological or emotional problems affecting their life or work. As presented in Figure 10, 19% reported anxiety or depression in the past year. Some may not report these issues due to stigma. According to Figure 11, during emergencies, 62% stayed calm, and 38% felt stress but managed it well, none panicked, showing strong composure. As evidenced by Figure 12, when asked if weight affects stress, 19% agreed, 73% denied it, and 8% were unsure. This disconnect may reflect limited awareness of the psychological and social dimensions of body weight and self-image.

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538



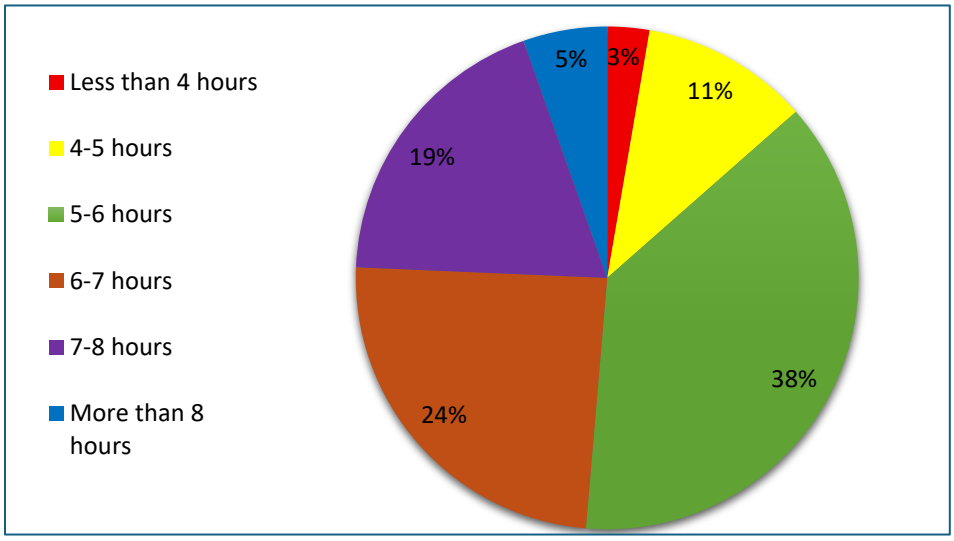


Figure 13: Realisation of exhaustion after a work-shift

Figure 14: Average sleeping hours per night among the responders

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

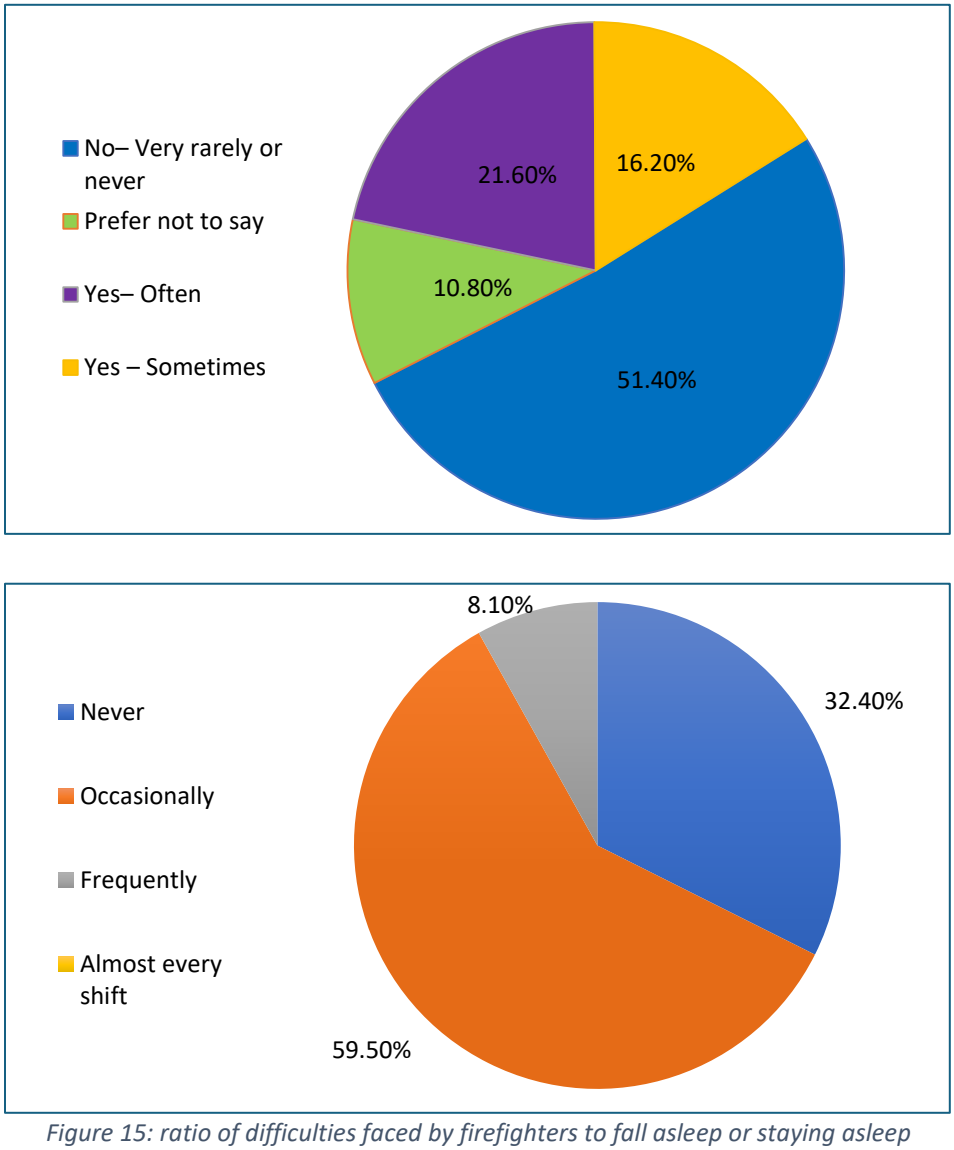


Figure 15: ratio of difficulties faced by firefighters to fall asleep or staying asleep

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 16: ratio presenting the frequency of mood swings

Figure 13 suggests that 38% sometimes felt emotionally exhausted, 3% often, and none always, though mild fatigue still matters. As depicted in Figure 14, Sleep varied: 38% got 5-6 hours, 24% got 6-7, 19% got 7-8, and 13% slept under 5 hours. From Figure 15, it can be observed that 38% had sleep problems like difficulty falling asleep, showing poor sleep quality. As presented in Figure 16, mood swings were common: 60% had them occasionally, 8% often. Yet few sought helps possibly from lack of awareness or discomfort. Figure 17 confirms that, to cope, 57% exercised, 41% talked to someone, and 38% rested. Some used unhealthy coping: 27% smoked, 8% ate fast food. There is a need for more comprehensive education on stress management and mental health awareness.

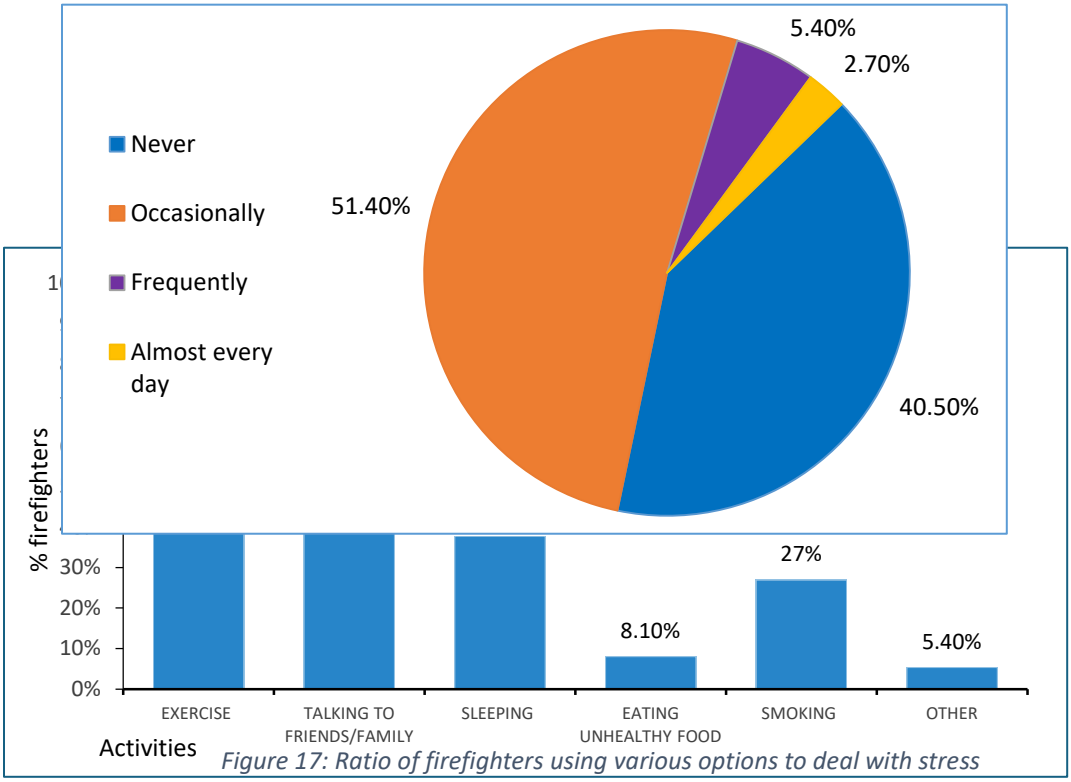


Figure 17: Ratio of firefighters using various options to deal with stress

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 18: Symptoms of physical stress and their frequency

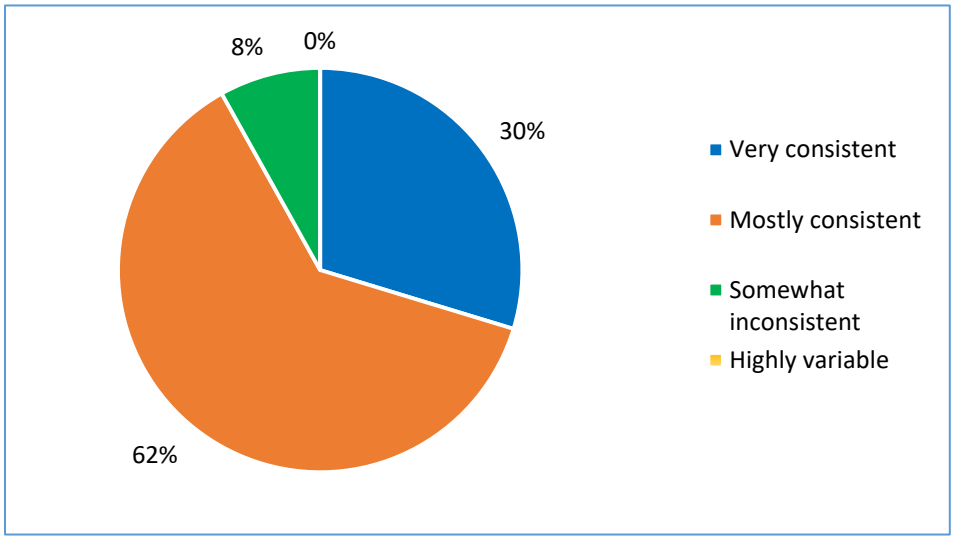
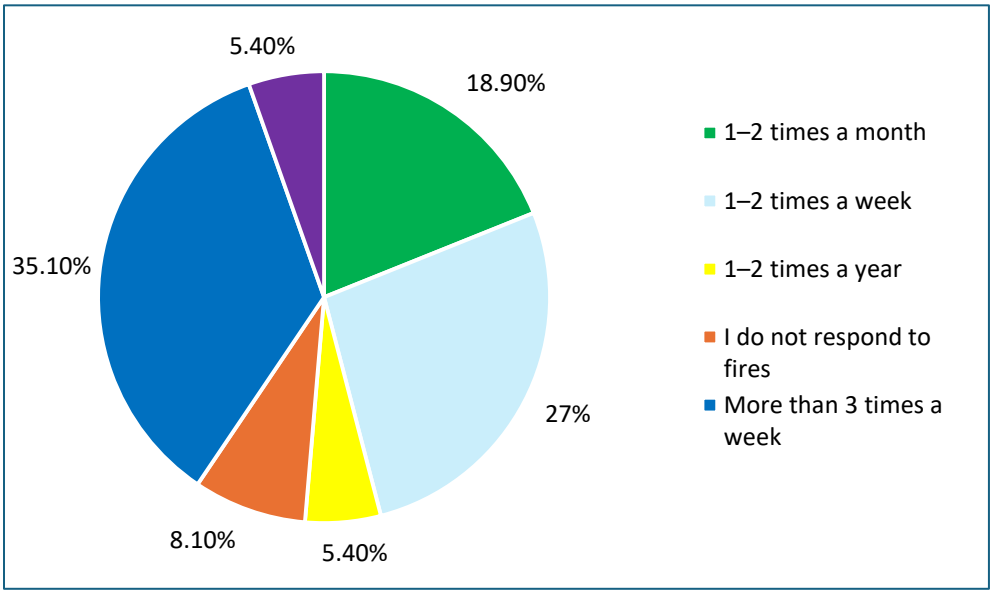


Figure 5: Ability to maintain consistent mood and energy levels throughout the week

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

According to Figure 18, more than half of the participants, 51% reported experiencing occasional physical stress, such as headaches or muscle aches. 5.4% noted frequent symptoms, while 2.7% experienced them almost daily. This demonstrates that stress affects both the body and mind, reflecting the psychological burden inherent in high-



risk occupations. Figure19 suggests that, most 62% reported being able to maintain a relatively stable mood. Another 30% reported being able to maintain a stable mood throughout the week. Additionally, only 8% experienced mood swings, indicating a general baseline level of emotional control.

Figure 20: Frequency of fire incidents responded

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

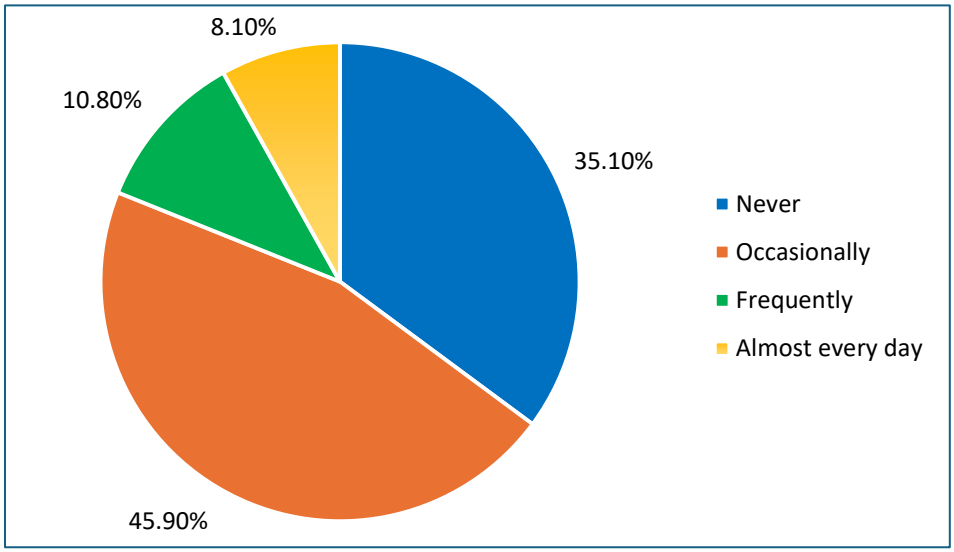


Figure 21: Frequency to reach out to friends or family to talk about your feelings or challenges

Figure 20 suggests that Fire incident exposure varied: 35% faced more than three per week, 27% one or two weeklies, enough to cause accumulated stress and potential chronic distress. As presented in Figure 21, social support levels were concerning: 35% never talked to family or friends about feelings, and 46% only occasionally did. This significant percentage suggests that it is difficult for them to cope with stress if they are unable to seek social support.

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

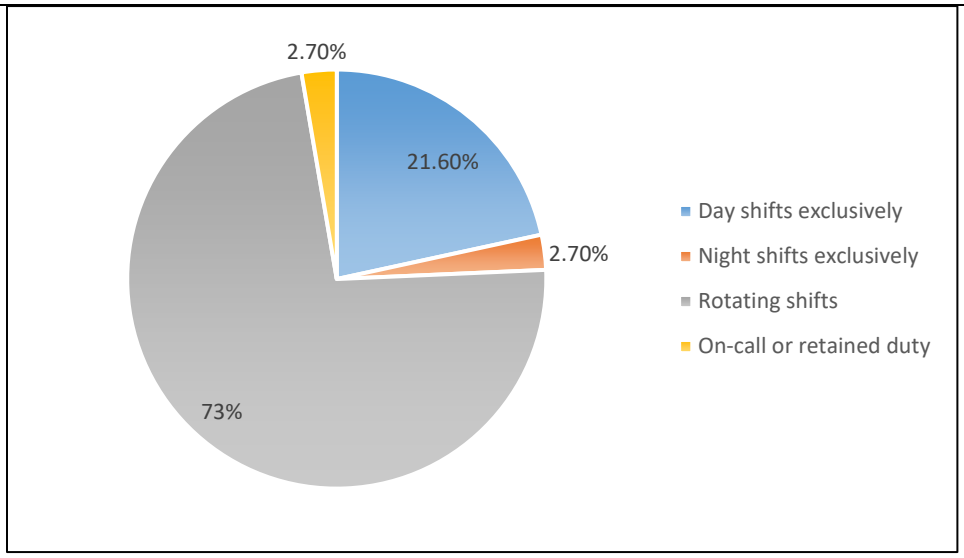


Figure 22: Typical Work Shift Schedule

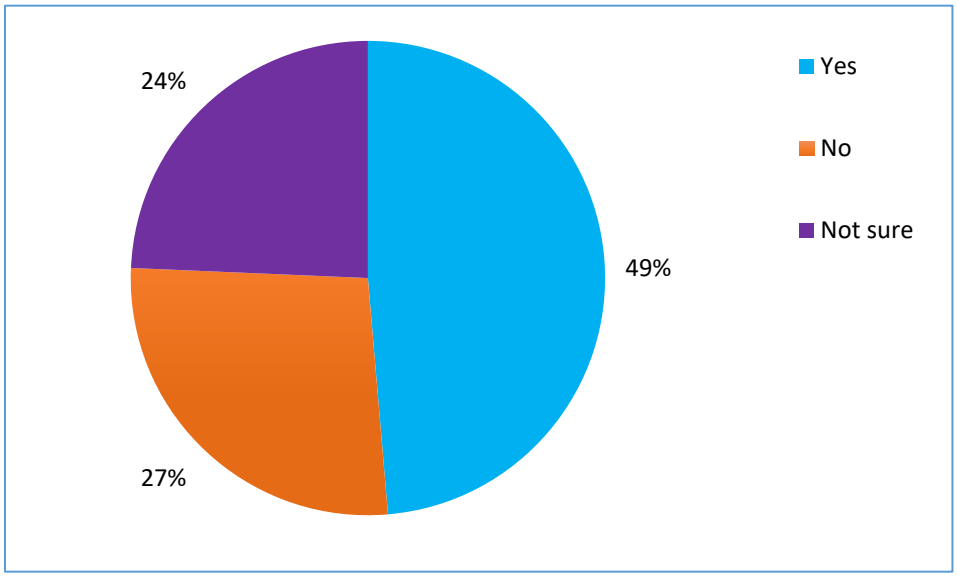


Figure 23: Opinion on the mental health management resources availability

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Figure 22 shows that most firefighters (73%) worked rotating shifts, which disrupts biological rhythms and affects mental health. Only 2.7% worked nights only, and 22% worked fixed day shifts. Based on Figure 23, regarding mental health resources, about 50% said enough support was available, 27% said no, and 24% were unsure. So maybe support is there, but not easy to reach or understand. This study shows that many firefighters face physical and mental health challenges, with 65% of participants experiencing overweight or obesity, fatigue, and stress. While they try to maintain their calm on the job, this doesn't mean they don't experience internal challenges. Mental health issues vary widely, though they are underreported, with some resorting to harmful habits such as smoking or poor nutrition. The study indicates that firefighters are strong, but they also need psychological support to cope with stress in a healthy way, including good sleep, adequate physical activity, healthy eating, and coping with stress, as they frequently face physical and mental challenges.

3. Conclusion

The results of this study provide insights into the relationship between Body Mass Index (BMI) and mental health of firefighters, a population exposed to intense physical exertion and psychological stress. A higher BMI was found to be associated with an increased risk of mental health disorders, which negatively impact job performance and overall well-being. A higher BMI was also associated with decreased psychological resilience.

These findings highlight the importance of developing comprehensive intervention strategies that promote physical fitness and psychological resilience. This includes encouraging healthy weight management through proper nutrition and exercise, along with psychological support through counselling, resilience training, and peer support systems. These interventions will enhance operational readiness, reduce health risks, and create a more resilient and effective firefighting workforce.

Acknowledgments

The author sincerely acknowledges the guidance and support of his supervisor, Mr. Meet Panchal, whose expertise and encouragement were instrumental in the completion of this study. Deep appreciation is extended to the firefighters who voluntarily participated in the research and to the fireground staff of IIFS for their valuable cooperation and assistance, which significantly contributed to the successful conduct of the study. The author also expresses gratitude to the International College of Engineering and Management (ICEM) for providing the institutional platform and resources that facilitated this work. Finally, the author gratefully acknowledges the unwavering support of his family and friends, whose encouragement and motivation played a vital role throughout the research process.

Statement of Ethics

This project was intended to examine the effect of Body Mass Index (BMI) on the mental health of 37 firefighters working at various fire departments. BMI is calculated by measuring the participants' height and weight, and the intension of surveys/questionnaire is exclusively to assess mental health issues. Ethical practices will include securing informed consent from all participants and ensuring the highest level of privacy protection. The goal of this research is to gain insights that can ultimately improve mental health support programs for firefighters.

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Declaration of conflicts

The authors declare that they have no known competing financial or personal conflict of interest that could have influenced the work of the manuscript.

References

Aisbett, B., Wolkow, A., Sprajcer, M., & Ferguson, S. A. (2012). Awake, smoky, and hot: Providing an evidence base for managing the risks associated with occupational stressors encountered by wildland firefighters. *Applied Ergonomics, 43*(5), 916–925. https://doi.org/10.1016/j.apergo.2011.12.013

Bhugra, D., Till, A., & Sartorius, N. (2013). What is mental health? *International Journal of Social Psychiatry, 59*(1), 3–4. https://doi.org/10.1177/0020764012463315

Bonita, I., Halabicky, O. M., & Liu, J. (2024). Exposure to wildfire smoke and mental health problems among firefighters: A systematic review. *Atmosphere, 15*(1), 78. https://doi.org/10.3390/atmos15010078

Bucala, M., & Sweet, E. (2019). Obesity in the fire service: An inside look at the perceptions of firefighters towards obesity and other health issues. *Journal of Occupational and Environmental Medicine, 61*(5), e232–e238. https://doi.org/10.1097/JOM.0000000000001578

Gonzalez, D. E., Lanham, S. N., Martin, S. E., Cleveland, R. E., Wilson, T. E., Langford, E. L., & Abel, M. G. (2024). Firefighter health: A narrative review of occupational threats and countermeasures. *Proceedings of the Healthcare Conference 2024*, 440. MDPI. https://doi.org/10.3390/proceedings2024040440

Harvey, S. B., Milligan-Saville, J. S., Paterson, H. M., Harkness, E. L., Marsh, A. M., Dobson, M., Kemp, R., & Bryant, R. A. (2016). The mental health of firefighters: An examination of the impact of repeated trauma exposure. *Australian & New Zealand Journal of Psychiatry, 50*(7), 649–658. https://doi.org/10.1177/0004867415615217

IFSTA. (2007). *Essentials of firefighting and fire department operations* (5th ed., pp. 52–53). Fire Protection Publications.

Jahnke, S. A., Poston, W. S. C., Haddock, C. K., & Murphy, B. (2016). Firefighting and mental health: Experiences of repeated exposure to trauma. *Work, 53*(4), 737–744. https://doi.org/10.3233/WOR-162260

Johnson, C. C., Vega, L., Kohalmi, A. L., Roth, J. C., Howell, B. R., & Van Hasselt, V. B. (2020). Enhancing mental health treatment for the firefighter population: Understanding fire culture, treatment barriers, practice implications, and research directions. *Professional Psychology: Research and Practice, 51*(3), 304–311. https://doi.org/10.1037/pro0000289

Kales, S. N., Soteriades, E. S., Christophi, C. A., & Christiani, D. C. (2007). Emergency duties and deaths from heart disease among firefighters in the United States. *New England Journal of Medicine, 356*(12), 1207–1215. https://doi.org/10.1056/NEJMoa060357

ORIGINAL RESEARCH | e-Published: January 19, 2026 *Open Access*

International Journal of Safety, Health, and Environmental Research, Vol. 1, No. 1 (2026). pp. 01-22 DOI: 10.69481/RTCA1538

Kales, S. N., Soteriades, E. S., Christoudias, S. G., & Christiani, D. C. (2003). Firefighters and on-duty deaths from coronary heart disease: A case–control study. *Environmental Health, 2*, 14. https://doi.org/10.1186/1476-069X-2-14

Lim, J. U., Lee, J. H., Kim, J. S., Hwang, Y. I., Kim, T. H., Lim, S. Y., Yoo, K. H., Jung, K. S., Kim, Y. K., & Rhee, C. K. (2017). Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. *International Journal of Chronic Obstructive Pulmonary Disease, 12*, 2465–2475. https://doi.org/10.2147/COPD.S141295

Manwell, L. A., Barbic, S. P., Roberts, K., Durisko, Z., Lee, C., Ware, E., & McKenzie, K. (2015). What is mental health? Evidence towards a new definition from a mixed methods multidisciplinary international survey. *BMJ Open, 5*(6), e007079. https://doi.org/10.1136/bmjopen-2014-007079

National Fire Protection Association. (2022). *NFPA 1583: Standard on health-related fitness programs for fire department members*. NFPA.

Nuttall, F. Q. (2015). Body mass index: Obesity, BMI, and health: A critical review. *Nutrition Today, 50*(3), 117–128. https://doi.org/10.1097/NT.0000000000000092

Ras, J., Smith, D. L., Kengne, A. P., Soteriades, E. E., & Leach, L. (2022). Cardiovascular disease risk factors, musculoskeletal health, physical fitness, and occupational performance in firefighters: A narrative review. *Journal of Environmental and Public Health, 2022*, 7346408. https://doi.org/10.1155/2022/7346408

Stensland, S. H., & Margolis, S. (1990). Simplifying the calculation of body mass index for quick reference. *Journal of the American Dietetic Association, 90*(6), 856–857.