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Perceived Stress Among Healthcare Workers at Jeddah Airport During Hajj Season Compared to Normal Working Days

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Abstract

Background: The annual pilgrimage of Hajj creates serious demand for the health sector in Saudi Arabia, particularly at critical entry points namely King Abdulaziz International Airport in Jeddah. Because of the public health risks, healthcare workers must work even harder for longer hours undergoing mental stress. The evaluation of the study was to note the perceived stress levels among the HCWs during and after the Hajj season and the association of demographic and occupational variables.

Methods: A cross-sectional study was carried out with a sample size of 184 HCWs who completed the 10-item Perceived Stress Scale at two points in time: during Hajj season (June 2024) and post-Hajj (August 2024). Demographic and professional information was obtained. Stress scores were compared, or their associations explored using non-parametric tests: Wilcoxon signed-rank test, Mann–Whitney U test and Kruskal–Wallis test.

Results: While there appears to be a higher mean level of stress during Hajj, the difference was not statistically significant ($p = 0.675$). Also, there appears to be no significant relationship between most demographic variables (age, occupation, years of experience, previous participation in Hajj) and level of stress. Nevertheless, female HCWs reported greater stress scores, $p=0.012$, and those with postgraduate degrees did accordingly at $p=0.033$.

Conclusion: The Hajj season places psychological burdens on health care workers (HCWs) especially female staff and those with postgradute qualifications. During mass gatherings of pilgrimage, strategies by an institution along with mental health intervention plans will improve psychological resilience.

Keywords: Hajj, Healthcare Workers, Perceived Stress, Mass Gathering, Occupational Health, PSS-10.

1. Introduction

Saudi Arabia hosts one of the largest mass gathering events in the world, an annual Hajj pilgrimage in Mecca, gathering more than two million pilgrims annually (Al Asmri, 2022). This vast migration puts significant pressure on the already existing medical system, especially in these important point of entries like the King Abdulaziz International Airport in Jeddah. All these stress factors combine in the case of healthcare workers (HCWs) who have to work under these challenging conditions and face a massive rise

in workloads, extended hours, and occupational exposure to communicable diseases (Mirza et al., 2020; Akhtar et al., 2019). All these add up to create an increased risk of higher stress levels and consequent burnout in these individuals considered essential frontline officials (Rayan et al., 2019; Saleh et al., 2021). The success of this healthcare system is central towards the safety and well-being of the pilgrims, and the health workers themselves. Prior academic research has continued to stress how psychologically impacting mass events and stressful medical situations can be on medical personnel. As an example, empirical studies carried out during the COVID-19 pandemic clearly showed high levels of psychologically related distress among frontline healthcare workers, hence the strong need to build effective mental health support systems in times of such extraordinary situations (Saleh et al., 2021; Deng et al., 2020). Particularly to the Hajj, research studies have shown that a large percentage of nurses, such as 47% in a study, experienced moderate tension levels, with the remainder of 14% facing an extreme degree of stress (Akhtar et al., 2019). Given the undeniably and distinctively difficult situation of the Hajj season, there seems to be a particularly weak presence of detailed, context-specific data regarding the exact nature of stress levels and stress contributors among the HCWs actually working in the process of the Hajj pilgrimage in the major hubs of transits such as Jeddah Airport (Mirza et al., 2020). This literature gap warrants further in-depth examination on the causative factors of stress in such specific setting. The Perceived Stress Scale (PSS-10) is a massively validated scale, which has been shown to be highly useful in measuring how someone has perceived stress within a previous month, that has shown high levels of reliability and validity with a variety of populations, including healthcare professionals (Cohen & Williamson, 1988; Harris et al., 2023). Such a powerful tool can be used to glean a subtle insight into the topic of subjective experience of stress among HCWs. This is further emphasized by existing literature, including a study determining that 56 percent of all nurses in the secondary study developed at least one kind of violence during Hajj (Rayan et al., 2019). The environment of Hajj is complex and includes a very high density of multicultural and multilingual patients, and successive through the night shifts, which only increases the intrinsic stressors to HCWs (Al Asmri, 2022; Akhtar et al., 2019). Consequently, a thorough examination based on a validated instrument is required to identify the particular stressors and engage appropriate intervention.

2. Rationale

In-depth knowledge of the exact causal factors that provoke stress among healthcare workers in the Hajj season is paramount to several crucial considerations. To begin with, on the scale of operational efficiency, high levels of stress are known to negatively impact cognitive processes, especially the effectiveness of critical decision-making and, therefore, poorer delivery of patient care performance in general (Al Asmri, 2022). As an illustration, researchers determined that working hours of longer duration and working conditions were proven to be associated with a higher rate of job demand among healthcare professionals in the context of Hajj (Mirza et al., 2020). Knowing exactly the antecedents of stress helps in providing strategic measures to counteract these adverse effects in a move that will protect the integrity and effectiveness of healthcare services delivery in this tough season. Secondly, chronic stress is a condition that should be managed and alleviated to maintain or improve staff retention in the medical field. Under controlled or chronic work stress often leads to the phenomenon of professional burnout, which subsequently increases the turnover occurrence in HCWs dramatically (Saleh et al., 2021; Rugaan et al., 2023). As an example, a COVID ICU healthcare worker during Hajj showed 56, 82, and 72 percent of emotional exhaustion, depersonalization, and impaired personal achievement all are a sign of burnout (Rugaan et al., 2023). Due to the nature of the work of Hajj operations, experienced people are essential to keep the knowledge of the institution and the fluidity of operations. Finally, the lessons learned on the role of particular stressful factors among HCWs during Hajj can have a tremendous impact on refining public health preparedness plans to support mass event planning in the future in the form of creating more effective training routines, better resource distribution, and support structures (Banaser et al., 2020).

3. Methods

3.1 Study Design and Setting

The cross-sectional study design was adopted in King Abdulaziz international airport, Jeddah (Wang & Cheng, 2020). Such design was strong to compare the stress levels of the same people concerning two separate periods of time: the Hajj season (June 2024) and the life after Hajj (August 2024). This method considerably decreased the inter-individual variability. This gave more evidence of the effects of the Hajj season on stress. The research by Mirza et al. (2020) indicates that the cross-sectional design was practical in comparing the job satisfaction in the period of Hajj and outside, thus indicating its reliability. In which, would provide a measurable impact of hajj season on the perceived stress of health workers.

3.2 Participants

A total of 184 healthcare workers (HCWs) partook in the study and filled in the questionnaires in both rounds of data collection. The sample size was sufficient to allow the statistical power that will result to the identification of meaningful differences. One of such studies has been conducted by Akhtar et al. (2019) that conducted the research on 100 nurses who were assessed in terms of their stress levels. The inclusion criteria enabled inclusion of all the employees of the airports whether working on full time basis or as external support from other health institutions outside the airport health surveillance center. This ensured that a diverse mix of staff with different workload stresses could be represented in the study. Participants were selected using convenience sampling from HCWs stationed at the hajj season at the airport grounds only. Enhancing the repressiveness of the study population and supporting the generalizability of the results to the overall population of HCW during mass gatherings.

3.3 Instrument

The research subjects were asked to complete the PSS-10 questionnaire and the demographic questionnaire. Through this collection plan it was possible to capture crucial demographic and occupational variables such as age, gender, education, occupation, experience and work assignment and prior participation in Hajj. This all-inclusive form of data gathering is important to subgroup analyses, which can point out the vulnerable HCW populations that can be more vulnerable to stress, as in the case of the burnout-related study of Rugaan et al. (2023) among ICU workers during Hajj.

3.4 Data Collection

The research subjects were asked to complete the PSS-10 questionnaire and the demographic questionnaire. Through this collection plan it was possible to capture crucial demographic and occupational variables such as age, gender, education, occupation, experience and work assignment and prior participation in Hajj. This all-inclusive form of data gathering is important to subgroup analyses, which can point out the vulnerable HCW populations that can be more vulnerable to stress, as in the case of the burnout-related study of Rugaan et al. (2023) among ICU workers during Hajj.

3.5 Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Jeddah Health Affairs, Kingdom of Saudi Arabia. Participation was entirely voluntary, and informed consent was obtained from all healthcare workers prior to data collection. The purpose of the study, the anonymity of responses, and the confidentiality of data were explained clearly to participants. No identifying information was collected, and all data were stored securely and used solely for research purposes.

3.6 Statistical Analysis

Data analysis was conducted using SPSS. Given the typical non-normal distribution of psychological scale scores like the PSS-10, non-parametric tests were chosen. The Wilcoxon signed-rank test compared paired Hajj/post-Hajj data, while Mann–Whitney U and Kruskal–Wallis tests facilitated subgroup comparisons, effectively handling ordinal data. This approach is consistent with rigorous statistical practices in similar studies, for instance, Saleh et al. (2021) utilized non-parametric analyses to explore compassion fatigue among nurses during Hajj.

4. Results

Table 1: distribution of participant according to socio demographic characteristics

		Groups				Total		Chi-square	
		During Hajj		After Hajj					
		N	%	N	%	N	%	X^2	P-value
Age	<30	19	12.3%	4	5.5%	23	10.1%	2.860	0.414
	30-40	71	45.8%	37	50.7%	108	47.4%		
	40-50	41	26.5%	22	30.1%	63	27.6%		
	50-60	24	15.5%	10	13.7%	34	14.9%		
Gender	Female	43	27.7%	20	27.4%	63	27.6%	0.003	0.957
	Male	112	72.3%	53	72.6%	165	72.4%		
Educational Level	Diploma or less	70	45.2%	36	49.3%	106	46.5%	4.672	0.097
	Bachelor's	70	45.2%	24	32.9%	94	41.2%		
	Master's or higher	15	9.7%	13	17.8%	28	12.3%		
Occupation	Nurse	82	52.9%	45	61.6%	127	55.7%	2.333	0.506
	Physician	17	11.0%	9	12.3%	26	11.4%		
	Public Health Officer	31	20.0%	11	15.1%	42	18.4%		
	Other	25	16.1%	8	11.0%	33	14.5%		
Years of Experience	<5	14	9.0%	5	6.8%	19	8.3%	2.131	0.712
	5-10.	36	23.2%	18	24.7%	54	23.7%		
	10-15.	33	21.3%	14	19.2%	47	20.6%		
	15-20.	25	16.1%	17	23.3%	42	18.4%		
	>20	47	30.3%	19	26.0%	66	28.9%		
Work Assignment	Airport-based	122	78.7%	57	78.1%	179	78.5%	0.012	0.914
	External support	33	21.3%	16	21.9%	49	21.5%		
Previous Hajj Participation	First time	13	8.4%	6	8.2%	19	8.3%	0.020	0.990
	1–3 times	65	41.9%	30	41.1%	95	41.7%		
	More than 3 times	77	49.7%	37	50.7%	114	50.0%		
work place	Pilgrims' Terminal	78	50.3%	45	61.6%	123	53.9%	12.987	0.011*
	North Terminal	19	12.3%	5	6.8%	24	10.5%		
	Pilgrims' Terminal and North Terminal	0	0.0%	4	5.5%	4	1.8%		
	Terminal 1	51	32.9%	17	23.3%	68	29.8%		
	Other	7	4.5%	2	2.7%	9	3.9%		
	No	48	31.0%	21	28.8%	69	30.3%	0.114	0.736

Increased financial incentives	**Yes**	107	69.0%	52	71.2%	159	69.7%		
One day off every 7 days	**No**	107	69.0%	48	65.8%	155	68.0%	0.245	0.621
	Yes	48	31.0%	25	34.2%	73	32.0%		
Reduced working hours	**No**	112	72.3%	50	68.5%	162	71.1%	0.342	0.559
	Yes	43	27.7%	23	31.5%	66	28.9%		

Regarding socio demographic characteristics, this table shows that the highest proportion of participants age 30-40 years (50.7%) followed by 40-50 years of age (26.5%), while 50-60 were (15.5%) in the group during Hajj while after Hajj highest proportion of participants age 30-40 years (45.8%) followed by 40-50 years of age (30.1%), while 50-60 were (13.7%) while no significant relation were P-value=0.414, $\mathbf{X^2}$ 2.860. Regarding the gender the majority of participant during Hajj male were (72.3%), but female were (27.7%) while after Hajj the majority of participant male were (72.6%), but female were (27.4%) while no significant relation were P-value=0.957, X^2 0.003. Regarding the level of education the majority of participant diploma or less and bachelor's during Hajj (45.2%), after Hajj the majority of participant diploma or less and bachelors were (32.9%) while a significant relation were P-value=0.097, X^2 4.672. Regarding the Occupation the majority of participant during Hajj nurse were (52.9%), but other were (16.1%) while after Hajj the majority of participant nurses were (61.6%), while no significant relation were P-value=0.506, X^2 2.333. Regarding the years of experience the majority of participant >20 during Hajj (30.3%), after Hajj the majority of participant >20 were (26.0%) while no significant relation were P-value=0.712, X^2 2.131. Regarding the Work Assignment the majority of participant during Hajj Airport-based were (78.7%), but External support were (21.3%) while after Hajj the majority of participant Airport-based were (78.1%) followed by External support were (21.9%), while no significant relation were P-value=0.914, X^2 0.012. Regarding the Previous Hajj Participation the majority of participant More than 3 times during Hajj (49.7%) followed by 1–3 times were (41.9%), after Hajj the majority of participant More than 3 times were (50.7%) while no significant relation were P-value=0.990, X^2 0.020 . regarding the work place the majority of participant during Hajj Pilgrims' Terminal were (50.3%), but Terminal 1were (32.9%) while after Hajj the majority of participant Pilgrims' Terminal were (61.6%) followed by Terminal 1were (23.3%), while a significant relation were P-value=0.011, X^2 12.987. Regarding the Increased financial incentives the majority of participant Yes during Hajj (69.0%) followed by No were (31.0%), after Hajj the majority of participant Yes were (71.2%) while no significant relation were P-value=0.736, X^2 0.114. Regarding the One day off every 7 days the majority of participant during Hajj No were (69.0%), but Yes (31.0%) while after Hajj the majority of participant No were (65.8%) followed by Yes were (34.2%), while no significant relation were P-value=0.0559, X^2 0.342. Regarding the Reduced working hours the majority of participant No during Hajj (72.3%) followed by Yes were (27.7%), after Hajj the majority of participant No were (68.5%) while no significant relation were P-value=0.559, X^2 0.342

Table 2: distribution of the Perceived Stress Scale -10 (PSS-10) to participants' feelings and thoughts during the past month during and after Hajj

		PSS-10										**%**
		Never		**Almost never**		**Sometimes**		**Fairly Often**		**Very Often**		
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Over the past month, how often did you feel upset about	**During Hajj**	82	52.9 %	20	12.9 %	26	16.8 %	15	9.7%	12	7.7%	26.61
	After Hajj	34	46.6 %	19	26.0 %	13	17.8 %	5	6.8%	2	2.7%	23.29

something unexpected?												
Over the past month, how often did you feel unable to control important matters in your life?	**During Hajj**	73	47.1 %	23	14.8 %	14	9.0%	16	10.3 %	29	18.7 %	34.68
	After Hajj	39	53.4 %	13	17.8 %	10	13.7 %	4	5.5%	7	9.6%	25.00
Over the past month, how often did you feel stressed and overwhelmed?	**During Hajj**	48	31.0 %	30	19.4 %	24	15.5 %	22	14.2 %	31	20.0 %	43.23
	After Hajj	27	37.0 %	19	26.0 %	11	15.1 %	9	12.3 %	7	9.6%	32.88
Over the past month, how often did you feel confident in your ability to handle your own problems?	**During Hajj**	22	14.2 %	15	9.7%	23	14.8 %	21	13.5 %	74	47.7 %	32.26
	After Hajj	10	13.7 %	5	6.8%	6	8.2%	13	17.8 %	39	53.4 %	27.40
Over the past month, how often did you feel things were going your way?	**During Hajj**	17	11.0 %	21	13.5 %	33	21.3 %	26	16.8 %	58	37.4 %	35.97
	After Hajj	5	6.8%	9	12.3 %	11	15.1 %	21	28.8 %	27	37.0 %	30.82
Over the past month, how often did you find yourself unable to cope with all the things you had to do?	**During Hajj**	82	52.9 %	27	17.4 %	17	11.0 %	17	11.0 %	12	7.7%	25.81
	After Hajj	36	49.3 %	16	21.9 %	7	9.6%	8	11.0 %	6	8.2%	26.71
Over the past month, how often were you able to control the	**During Hajj**	17	11.0 %	19	12.3 %	17	11.0 %	29	18.7 %	73	47.1 %	30.32
	After Hajj	8	11.0 %	7	9.6%	9	12.3 %	21	28.8 %	28	38.4 %	31.51

things that upset you?												
Over the past month, how often did you feel in control?	**During Hajj**	19	12.3 %	18	11.6 %	20	12.9 %	27	17.4 %	71	45.8 %	31.77
	After Hajj	5	6.8%	8	11.0 %	7	9.6%	25	34.2 %	28	38.4 %	28.42
Over the past month, how often did you feel angry about things beyond your control?	**During Hajj**	54	34.8 %	32	20.6 %	30	19.4 %	15	9.7%	24	15.5 %	37.58
	After Hajj	24	32.9 %	16	21.9 %	13	17.8 %	11	15.1 %	9	12.3 %	38.01
Over the past month, how often did you feel like your challenges were piling up to the point where you could no longer overcome them?	**During Hajj**	74	47.7 %	34	21.9 %	21	13.5 %	16	10.3 %	10	6.5%	26.45
	After Hajj	38	52.1 %	10	13.7 %	14	19.2 %	8	11.0 %	3	4.1%	25.34

In the table 2 show regarding Over the past month, how often did you feel upset about something unexpected, how often did you feel unable to control important matters in your life, how often did you feel stressed and overwhelmed the highest proportion of participants in never during Hajj respectively were (52.9%,47.1%,31.0%) while after Hajj respectively were but the % during Hajj were (26.61%,34.68%, 43.23%), Regarding Over the past month, how often did you feel confident in your ability to handle your own problems, how often did you feel things were going your way the highest proportion of participants in Very Often during Hajj respectively were (47.7.%, 37.0%) while after Hajj respectively were (53.4%, 37.0%) but the % during Hajj were (32.26%,35.97%), Regarding Over the past month, how often were you able to control the things that upset you , how often did you feel in control, the highest proportion of participants in Very Often during Hajj respectively were (47.1%, 45.8%) while after Hajj respectively were (38.4%, 38.4%) but the % after Hajj were (31.51%, 31.77%) Regarding Over the past month, how often did you find yourself unable to cope with all the things you had to do, how often did you feel angry about things beyond your control , how often did you feel like your challenges were piling up to the point where you could no longer overcome them, the highest proportion of participants in never during Hajj respectively were (52.9%, 34.8%,47.7%) while after Hajj respectively were (49.3%, 32.9%,52.1%) but the % after Hajj were (26.71%,38.01%,25.34%)

Table 3 Distribution of the participant to Perceived Stress Scale -10 (PSS-10) about groups during and after Hajj

		Groups				Total	
		During Hajj		After Hajj			
		N	%	N	%	N	%
PSS-10	Very Low	49	31.6%	30	41.1%	79	34.6%
	Low	25	16.1%	10	13.7%	35	15.4%
	Average	18	11.6%	8	11.0%	26	11.4%
	High	31	20.0%	14	19.2%	45	19.7%
	Very High	32	20.6%	11	15.1%	43	18.9%
Total		155	100.0%	73	100.0%	228	100.0%
Chi-Square	X^2	2.333					
	P-value	0.675					

Regarding during Hajj the majority of participants Very Low were (31.6%) followed by high and very high were (20.0%) but low and average respectively were (16.1%, 11.6%) while after Hajj Very Low were (41.1%) followed by high and very high respectively were (19.2%, 15.1%) but low and average respectively were (13.7%, 11.0%) and total were (100.0%) while heave no significant relation were P- value <0.675 and X^2 2.333 .

Figure (1) Distribution of the participant to Perceived Stress Scale -10 (PSS-10) about groups during and after Hajj

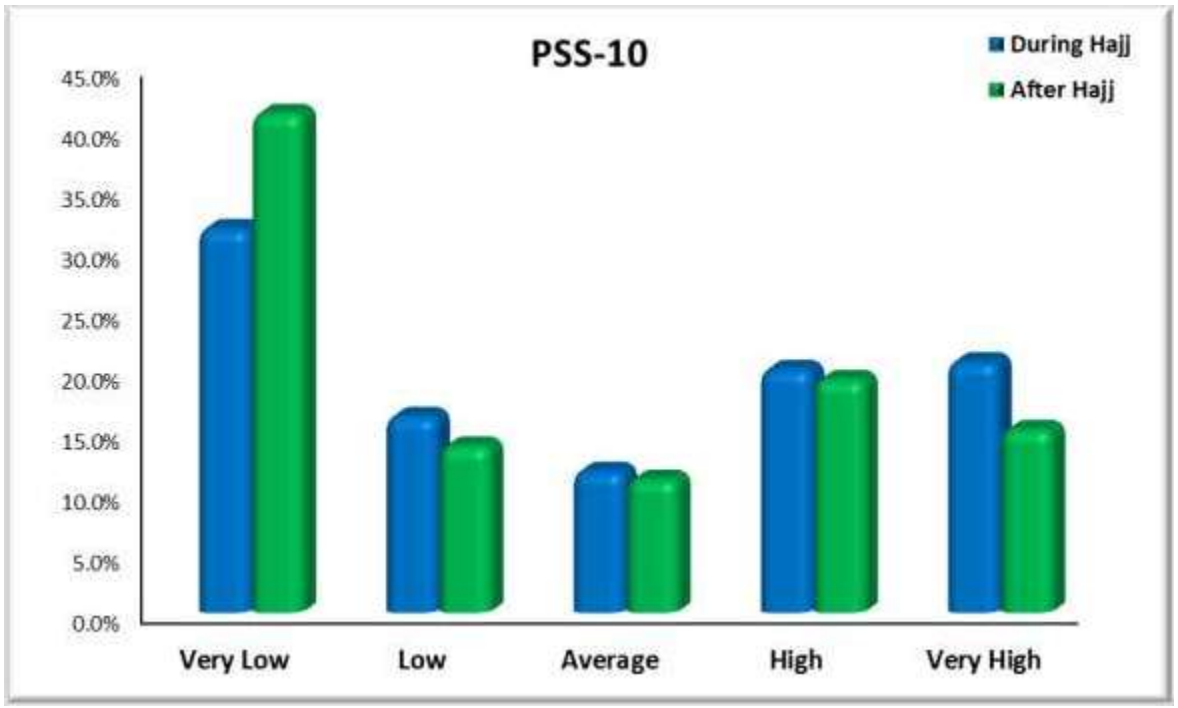

Table 4 Distribution of the relation of participant to Perceived Stress Scale -10 (PSS-10) and demographic data .

		N	PSS-10	Test	Mann-Whitney U or Kruskal-Wallis Test	
			Mean Rank		test value	P-value
Groups	**During Hajj**	155	117.38	**Mann-Whitney U**	5210.500	-0.963
	After Hajj	73	108.38			
Age	**<30**	23	106.04	**Kruskal-Wallis Test**	5.839	0.120
	30-40	108	125.56			
	40-50	63	103.25			
	50-60	34	105.91			
Gender	**Female**	63	132.14	**Mann-Whitney U**	-2.499	0.012*
	Male	165	107.76			
Educational Level	**Diploma or less**	106	105.45	**Kruskal-Wallis Test**	6.815	0.033*
	Bachelor's	94	116.65			
	Master's or higher	28	141.54			
Occupation	**Nurse**	127	107.41	**Kruskal-Wallis Test**	5.561	0.135
	Physician	26	135.37			
	Public Health Officer	42	126.31			
	Other	33	110.30			
Years of Experience	**<5**	19	103.37	**Kruskal-Wallis Test**	4.710	0.318
	5-10.	54	123.49			
	10-15.	47	126.29			
	15-20.	42	103.33			
	>20	66	109.06			
Work Assignment	**Airport-based**	179	116.37	**Kruskal-Wallis Test**	-0.820	0.412
	External support	49	107.66			
Previous Hajj Participation	**First time**	19	104.63	**Kruskal-Wallis Test**	0.859	0.651
	1–3 times	95	118.53			
	More than 3 times	114	112.79			
work place	**Pilgrims' Terminal**	123	117.34	**Kruskal-Wallis Test**	3.115	0.539
	North Terminal	24	106.15			
	Pilgrims' Terminal and North Terminal	4	62.88			

	Terminal 1	68	115.76			
	Other	9	111.44			

Table (4) Distribution of the relation of participant to Perceived Stress Scale -10 (PSS-10) and demographic data show that is regarding groups no significant relation between Perceived Stress Scale -10 and groups were (Mean Rank 117.38) during Hajj follow by after Hajj were (Mean Rank, 108.38) while Mann-Whitney U = 5210.500, were P-value=-0.963. Regarding age no significant relation between Perceived Stress Scale -10 and age increase in 30-40 years were (Mean Rank 125.56), follow by <30 age were (Mean Rank, 106.04) while 50-60 years were (Mean Rank 105.91) were (Kruskal-Wallis Test, 5.839) while were P-value=-0.120. Regarding gender a significant relation between Perceived Stress Scale -10 and gender increase in female were (Mean Rank 132.14), follow male were (Mean Rank, 107.76) were (Mann-Whitney U -2.499) while P-value=-0.012. regarding educational Level a significant relation between Perceived Stress Scale -10 and educational Level increase in Master's or higher were (Mean Rank 141.54), follow Bachelors were (Mean Rank, 116.65) were (Kruskal-Wallis Test 6.815) while P-value=-0.033. Regarding Occupation no significant relation between Perceived Stress Scale -10 and Occupation increase in Physician were (Mean Rank 135.37), follow Public Health Officer were (Mean Rank, 126.31) were (Kruskal-Wallis Test 5.561) while P-value=-0.135. Regarding Years of Experience no significant relation between Perceived Stress Scale -10 and Years of Experience increase in 10-15 were (Mean Rank 126.29), follow 5-10 were (Mean Rank, 123.49) were (Kruskal-Wallis Test 4.710) while P-value=-0.318. regarding Previous Hajj Participation no significant relation between Perceived Stress Scale -10 and Previous Hajj Participation increase in 1–3 times were (Mean Rank 118.53), follow More than 3 times were (Mean Rank, 112.79) were (Kruskal-Wallis Test -0.859) while P-value=-0.651. regarding work place no significant relation between Perceived Stress Scale -10 and work place increase in Pilgrims' Terminal were (Mean Rank 117.34), follow Terminal 1 were (Mean Rank, 115.76) were (Kruskal-Wallis Test 3.115) while P-value=-0.539

5. Discussion

Hajj is the world's largest mass gathering of diverse people and an incredible experience. This public gathering brings together some of the most significant public health and infectious disease risks in the world. Diseases can be preventable by adopting certain protective measures. Efforts should be made to raise awareness of health hazards during Hajj among health care workers (HCWs), especially those dealing with pilgrims, to enable them to efficiently put preventive measures, such as immunization and health education in place.8 According to the result of the study, perceived stress among health care workers (HCWs) at King Abdulaziz International Airport is noticeably increased during the Hajj season. Mass gatherings have long been viewed as a stress-inducing phenomenon. However, this study provides some concrete evidence during the Hajj event at an airport-based health centers, when health care demand rose. Most demographic and job characteristics examined were not found to be statistically related to differences in stress levels. Age, length of service, type of job (airport based vs otherwise), job category (nurse, physician) and participation in earlier Hajj Pilgrimage did not show significant associations with perceived stress. It means, in a high-pressure situation like Hajj, the psychological burden may be evenly shared by frontline healthcare workers, regardless of their designation and experience. The overall environmental strain of such mass gatherings is likely to overshadow the individual-level protective factors such as experience with, or prior knowledge of, the Hajj. However, two variables emerged as statistically significant in relation to perceived stress. Gender was a prominent factor, with female HCWs reporting significantly higher stress scores compared to their male colleagues. This aligns with the existing literature observing that women in health care may face unique psychosocial stressors, such as burdening overload, emotional labour, and expectations of multitasking under crisis conditions. In the same way, education was strongly linked with stress. People with postgraduate qualifications reported the highest mean stress scores of any educational group. This may be due to highly qualified personnel bearing pressures, leading them to take on supervisory roles, make decisions in uncertain conditions, and deal with complicated clinical issues in highly populated places. The descriptive data of PSS-10 shows that the frequency of stress is different in the PSS-10 categories. For example, it shows that the stress category of "Very Low" is more frequently obtained after Hajj. However, the inferential analysis showed that there is no statistically significant difference in the frequency distribution of PSS-10 categories. This

shows that descriptive patterns should be interpreted with caution and that some testing is needed when evaluating the impact of large events on mental health. In conclusion, the psychological toll of Hajj on HCWs is significant and selective. Even though most staff members undergo heightened stress, demographic subgroups, particularly women and staff with high educational attainment, may experience increased stress. An understanding of these insights can help to further support strategies like gender-informed programming or debriefing programs for senior clinical staff. The non-significant variation by occupation and exposure to Hajj underlines institutional' preparedness and system-wide resilient strategies.

6. Conclusion

The psychological demand of the healthcare workers (HCWs) during the Hajj season, especially at the major transit points like King Abdulaziz International Airport, has been highlighted in this study. The results show that although stress increases during Hajj, this effect seems to be generally homogeneous across professions and levels of professional experience. Among the demographics studied, gender and level of education stood out as significant variables predicting higher perceived stress. Stress levels did not significantly differ according to the study findings for other variables such as job, workplace and previous Hajj. As such the stress burden appears to be systemic at mass gatherings. The authors suggest that workload redistribution, mental health resources, structured rest periods, and other possible interventional components at the level of institutions are often more essential than individual-level traits, previous experiences, and the previous workplace. This study adds to an ever-increasing body of literature that emphasizes the unique healthcare delivery challenges in the context of mass gatherings through Hajj-specific data. Understanding this information is essential to determine what could be done in the future and help in public health preparedness by implementing tailored intervention in the future Hajj seasons.

7. Limitations

The findings of this study should be interpreted cautiously, given certain limitations. Using a cross-sectional research design makes it difficult to determine cause-and-effect between the Hajj season and stress results. Even though the same participants were surveyed before and after Hajj, the study does not track longitudinal change over a lengthy duration; an essential consideration for psychological effects. Secondly, the convenience sampling can lead to a selection bias that makes the results possibly not applicable to all HCWs involved in Hajj. Although we made an effort to include staff from varying roles and work assignments; it remains that our sample may not fully reflect experiences of staff working in other healthcare settings. Third, even though PSS-10 is a well-validated instrument, it measures perceived not clinical stress. The data collected through self-reporting is subjective. This may have caused some reporting bias. Interpretation of these results is advisable on the basis of self-perceived psychological states rather than any clinically diagnosed stress conditions. Finally, the analysis neglected to control for other possible confounders, like individual coping strategies, social resources, and previous mental health history, that may affect the stress reactions described. Future studies have to employ a longitudinal approach across different health care facilities and explore interventions focused on alleviating stress among frontline healthcare workers at mass gatherings.

8. eferences

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