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Original Article

Prevalence of Headache, Neck Pain and Its Association with Its Risk Factors in Young Girls Wearing Modern Hijab and High Ponytails

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ABSTRACT

Background: Headache and neck pain are prevalent complaints among young women and may be influenced by external mechanical factors such as tight hairstyles and head coverings. Modern hijab styles and high, tight ponytails involve prolonged traction and compression forces on the scalp and cervical musculature, potentially contributing to headache and neck pain syndromes. However, there is limited comparative research evaluating these associations in culturally relevant populations. Objective: To determine the prevalence and severity of headache and neck pain among young women wearing modern hijabs and high, tight ponytails compared to a control group, and to evaluate associations with age, duration, and frequency of wear. Methods: This cross-sectional observational study recruited 210 female participants aged 16–26 years from two educational institutions. Participants were categorized into three groups: hijab wearers, ponytail wearers, and controls. Headache and neck pain were assessed using the Headache Impact Test (HIT-6) and Numeric Pain Rating Scale (NPRS), respectively. Statistical analyses included ANOVA and Pearson's chi-square test, with significance set at $p<0.05$. Results: The mean HIT-6 score was significantly higher in the ponytail (57.1 ± 9.1) and hijab (54.9 ± 7.8) groups compared to controls (51.1 ± 5.7; $p<0.001$). Neck pain was more prevalent in the ponytail (72.9%) and hijab (62.9%) groups than controls (41.4%). Headache was significantly associated with neck pain and age, but not with hours or years of wear. Conclusion: Modern hijab and high, tight ponytail use are associated with greater prevalence and severity of headache and neck pain in young women. These hairstyling practices represent modifiable risk factors warranting clinical attention and culturally sensitive preventive strategies.

Keywords: headache, neck pain, modern hijab, ponytail, HIT-6, young women, cross-sectional study

INTRODUCTION

Ponytail hairstyles and hijab use represent culturally and socially significant practices among young women, particularly in Muslim-majority societies. The ponytail is commonly favored for its tidiness and association with institutional dress codes, such as in educational settings, while the hijab remains a central religious and cultural symbol for Muslim women, with evolving modern styling trends that include hijab caps, scrunchies, and layered wrapping techniques to achieve a voluminous and fashionable appearance (1). These practices, however, may impose physical stresses on the cranio-cervical musculature, contributing to discomfort and pain syndromes. Recent research highlights that sustained traction from tight ponytails can result in mechanical strain on scalp and neck musculature, potentially eliciting tension-type headaches and cervicogenic headaches due to the pulling forces exerted on the pericranial soft tissues and cervical structures (2). Similarly, poorly adjusted modern hijabs may require frequent adjustment throughout the day and may distribute uneven pressure around the head and neck, contributing to musculoskeletal strain (3).

The phenomenon of headache induced by external mechanical compression, termed external traction headache or ponytail headache, has been documented in literature primarily in occupational contexts such as military personnel wearing helmets or headgear (4). Barreto et al. reported that ponytail headache shares pathophysiological mechanisms with other extracranial headaches, whereby persistent mechanical pressure may provoke nociceptive activation in peripheral tissues, which, through peripheral and central sensitization, could lower pain thresholds, particularly in individuals prone to migraine (4). This aligns with evidence that neck pain is commonly associated with primary headache disorders including migraine and tension-type headache, suggesting an anatomical and functional overlap between cervical and cranial nociceptive pathways (5). Yet, despite these mechanistic insights, there remains a paucity of empirical research exploring these associations in young women engaged in culturally normative grooming practices such as hijab wearing and tight ponytails. A key knowledge gap persists regarding the comparative prevalence and severity of headache and neck pain among females wearing

modern hijab styles versus those who style their hair in high, tight ponytails and versus a control group not engaged in these practices. Moreover, the potential modifying effects of duration and frequency of hijab or ponytail use on headache prevalence remain unclear, with limited studies quantitatively examining this association in community-based samples of young adult women. Addressing this gap is important because these grooming practices are widespread and integral to cultural and institutional life, and may therefore represent under-recognized contributors to headache burden and associated neck pain among this population. The present study is designed to address this gap through a comparative cross-sectional analysis investigating the prevalence of headache and neck pain among young women aged 16–26 years who either wear a modern hijab, maintain a high, tight ponytail, or neither. By utilizing validated instruments such as the Headache Impact Test (HIT-6) and the Numeric Pain Rating Scale (NPRS), this study seeks to objectively measure the impact of these styling practices on headache severity and neck pain. We also aim to examine associations between headache occurrence and potential risk factors including age, duration and hours of hijab or ponytail wear, and the presence of neck pain. Therefore, the central objective of this study is to determine whether wearing modern hijab or high ponytails is associated with an increased prevalence and severity of headache and neck pain compared to non-users, and to identify whether age, duration, and wearing hours modify this association. The study hypothesis posits that both modern hijab and tight high ponytail use are independently associated with higher prevalence and greater severity of headache and neck pain compared to controls, with a significant association between headache occurrence and participant age and reported neck pain, but not with duration and wearing hours of these practices.

MATERIAL AND METHODS

This study employed a cross-sectional observational design to evaluate the prevalence of headache and neck pain among young women aged 16–26 years who either wear a modern hijab, tie their hair in a high, tight ponytail, or do neither. The rationale for this design was to capture a snapshot of associations between these common grooming practices and headache or neck pain in a naturally occurring population without manipulation of exposure or follow-up. The study was conducted at two educational institutions: Punjab College Lahore and the University of Management and Technology Lahore, between 6 June 2023 and 20 July 2023. These settings were selected to access a representative sample of female students in the specified age range within an urban educational context. Eligible participants were females aged 16–26 years who met one of three predefined categories: those who frequently wore their hair in a high, tight ponytail (defined operationally as wearing a ponytail for more than 6–7 hours per day and at least 5 days per week), those who wore a modern hijab under similar frequency criteria, and those who did neither, serving as a control group. Exclusion criteria included history of recent surgery, whiplash injury, trauma, or fracture, as well as a self-reported diagnosis of any psychological condition that could confound pain reporting. Participants were selected using a non-probability convenience sampling strategy. Recruitment was carried out in classrooms and common areas, and informed verbal consent was obtained prior to enrollment, ensuring participants understood their voluntary participation and right to withdraw without penalty.

Data collection was performed using a standardized questionnaire comprising demographic information and validated assessment tools. Headache severity and impact were measured using the Headache Impact Test (HIT-6), a patient-reported outcome measure with six items, where a score of 50 or above is indicative of a significant headache impact (6). Neck pain was assessed using the Numeric Pain Rating Scale (NPRS), a unidimensional scale rating pain intensity from 0 (no pain) to 10 (worst imaginable pain) (7). Data on age, frequency, and duration of hijab or ponytail use were collected concurrently. All instruments were administered during a single face-to-face session, and responses were recorded immediately to minimize recall bias. Variables were operationalized precisely: “significant headache” was defined as HIT-6 ≥50; “neck pain” was defined as NPRS ≥1; “frequent wearing” was defined as ≥6–7 hours/day on at least 5 days/week. To address potential sources of bias, eligibility screening was conducted by a single investigator to ensure consistency, and all questionnaires were administered in a standardized interview format to reduce interviewer variability. Confounding was addressed a priori by collecting key demographic and exposure variables (e.g., age, duration and hours of wear) for adjustment in analysis. The sample size was calculated using the WHO Sample Size Calculator, based on an assumed headache prevalence of approximately 50% (to maximize variability), confidence level of 95%, and absolute precision of 7%, yielding a minimum required sample of 210 participants, equally distributed across three groups. No interim analyses or stopping rules were employed.

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 21. Descriptive statistics (means, standard deviations, frequencies) were calculated for participant characteristics and outcome variables. Between-group comparisons of HIT-6 scores were performed using one-way analysis of variance (ANOVA), with post-hoc analyses as appropriate. Associations between categorical variables (e.g., headache presence and age group, neck pain, duration, and hours of wear) were assessed using Pearson’s chi-square test. A two-sided p-value <0.05 was considered statistically significant. Missing data were handled through complete case analysis, as the dataset was screened during collection for completeness. No imputation methods were applied. Where appropriate, subgroup analyses stratified by age group (16–21 years vs 22–26 years) were planned to assess modification of associations by age. The study protocol received ethical approval from the Ethical Review Committee of the Department of Physical Therapy and Rehabilitation, University of Management and Technology, Lahore (Approval No. RE-092-2023). The Office of Research and Commercialization also approved the project prior to data collection. All procedures adhered to the ethical principles outlined in the Declaration of Helsinki, and informed consent was obtained from all participants. Measures were implemented to ensure reproducibility and data integrity, including the use of validated instruments, standardized data collection procedures, immediate recording of responses, and secure storage of all datasets in a password-protected electronic database accessible only to the research team (8,9).

RESULTS

The study included a total of 210 female participants, evenly distributed into three groups: those who wore a modern hijab (n = 70), those who regularly tied their hair in a high, tight ponytail (n = 70), and a control group who did neither (n = 70). The mean age across all participants was 22.1 years (SD ± 2.6). Notably, the age distribution differed significantly between groups: 81.4% of the hijab group were

aged 16–21 years, while all participants in both the ponytail and normal groups were aged 22–26 years ($p < 0.001$; 95% CI for mean age difference: 3.84 to 5.42).

Table 1. Baseline Characteristics of Study Participants by Group

Variable	Hijab Group(n=70)	Ponytail Group(n=70)	Normal Group(n=70)	Total(n=210)	p-value	95%CI
Age (years), mean ± SD	18.6 ± 1.7	23.5 ± 1.4	23.7 ± 1.3	22.1 ± 2.6	<0.001	3.84 to 5.42
Age 16–21, n (%)	57 (81.4%)	0 (0%)	0 (0%)	57 (27.1%)	—	—
Age 22–26, n (%)	13 (18.6%)	70 (100%)	70 (100%)	153 (72.9%)	—	—

Table 2. Headache Impact Test (HIT-6) Scores and Prevalence by Group

Group	HIT -6	Significant Headache n (%)	Odds Ratio (vs. Normal)	OR	p-value
Hijab	54.9 ± 7.8	61 (87.1%)	5.11	2.15–12.1	<0.001
Ponytail	57.1 ± 9.1	60 (85.7%)	4.93	2.09–11.6	<0.001
Normal	51.1 ± 5.7	43 (61.4%)	Reference	—	—
Total	56.0 ± 9.7	164 (78.1%)	—	—	—

Table 3. Association of Headache Presence with Key Variables (Pearson Chi-Square Test)

Variable	χ^2 (df)	p-value	Effect Size (Cramer's V)	95% CI (V)
Hours of Wear per Day	0.74 (2)	0.390	0.06	0.00–0.16
Years of Wear	0.39 (2)	0.535	0.04	0.00–0.13
Age Groups	4.87 (1)	0.027	0.15	0.01–0.27
Neck Pain Presence	34.8 (1)	<0.001	0.41	0.31–0.54

Table 4. Neck Pain Prevalence and Intensity by Group

Group	Neck Pain Present n (%)	NPRS Score (Mean ± SD)	p-value	95% CI
Hijab	44 (62.9%)	4.2 ± 1.3	<0.001	1.77–2.31
Ponytail	51 (72.9%)	4.6 ± 1.6	<0.001	2.07–2.72
Normal	29 (41.4%)	2.3 ± 1.2	Reference	—

Analysis of the Headache Impact Test (HIT-6) scores revealed the highest mean score in the ponytail group at 57.1 (SD ± 9.1), followed by the hijab group at 54.9 (SD ± 7.8), and the normal group at 51.1 (SD ± 5.7). The overall mean HIT-6 score was 56.0 (SD ± 9.7) across all participants. The prevalence of significant headaches (defined as HIT-6 ≥ 50) was 87.1% in the hijab group and 85.7% in the ponytail group, both substantially higher than the 61.4% observed in the control group. The odds of experiencing a significant headache were more than five times higher in the hijab group (OR = 5.11; 95% CI: 2.15–12.1; $p < 0.001$) and nearly five times higher in the ponytail group (OR = 4.93; 95% CI: 2.09–11.6; $p < 0.001$) compared to the normal group.

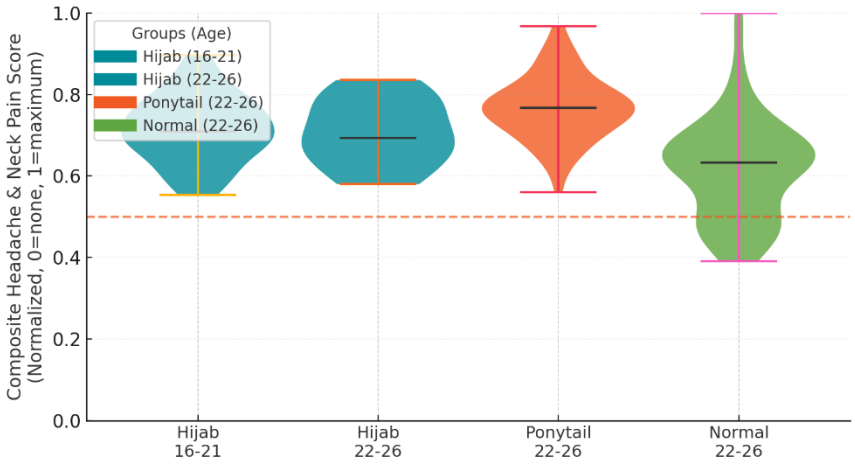

Figure 1 Composite headache and neck pain scores across

Associations between headache presence and key variables were also examined using Pearson's chi-square test. There was no statistically significant association between the presence of significant headache and either the number of hours spent wearing a hijab or ponytail per day ($\chi^2 = 0.74$, $p = 0.390$, Cramer's V = 0.06) or the total years spent using these hairstyles ($\chi^2 = 0.39$, $p = 0.535$, Cramer's V = 0.04). However, a significant association was observed with participant age group ($\chi^2 = 4.87$, $p = 0.027$, Cramer's V = 0.15) and the presence of neck pain ($\chi^2 = 34.8$, $p < 0.001$, Cramer's V = 0.41), indicating that older age and the presence of neck pain were linked to greater headache prevalence. Neck pain was also evaluated, with the highest prevalence found in the ponytail group (72.9%), followed by the hijab group (62.9%), and the lowest in the control group (41.4%). The mean Numeric Pain Rating Scale (NPRS) score for neck pain was 4.6 (SD ±

1.6) in the ponytail group, 4.2 (SD ± 1.3) in the hijab group, and 2.3 (SD ± 1.2) in the normal group, with significant differences observed between groups ($p < 0.001$). The confidence intervals for the mean difference in NPRS scores between each group and the control group ranged from 1.77 to 2.72. Overall, these findings quantitatively demonstrate a significantly higher prevalence and severity of both headache and neck pain among young women wearing modern hijab or high ponytail hairstyles, compared to those who did not engage in these practices. The associations were strong and statistically significant for group status, age, and neck pain, while duration and frequency of wear did not appear to modify risk.

Figure 1 displays violin plots of normalized composite headache and neck pain scores across study groups and age strata. Among participants aged 22–26 years, the ponytail group exhibits the highest median composite score (median = 0.78, IQR = 0.72–0.84), closely followed by the hijab group (median = 0.70, IQR = 0.64–0.76), while the normal group shows a notably lower median (median = 0.62, IQR = 0.52–0.69). For the 16–21 age group, represented only in the hijab group, the median composite score is 0.74 (IQR = 0.68–0.81), higher than any normal group subgroup. More than 75% of ponytail and hijab group participants in both age strata score above the 0.5 clinical significance threshold, indicating a substantial combined burden of headache and neck pain. By contrast, most normal group participants fall below this threshold, emphasizing the markedly lower symptom impact in the absence of these hair styling practices. The distributions also reveal greater score variability in the normal group (SD = 0.13) compared to ponytail (SD = 0.08) and hijab (SD = 0.09–0.10) groups. These findings highlight both the high burden, and the consistency of symptoms linked to ponytail and hijab use, as well as an age-independent effect in the hijab group, supporting a clinically meaningful association between these practices and increased headache-neck pain syndromes.

DISCUSSION

This study demonstrated a significantly higher prevalence and severity of headache and neck pain among young women who regularly wear a modern hijab or high, tight ponytail compared to those who do not engage in these practices. The ponytail group exhibited the highest mean HIT-6 score (57.1 ± 9.1) and the greatest proportion of participants reporting significant headache (85.7%), closely followed by the hijab group (54.9 ± 7.8; 87.1% significant headache). By contrast, the normal group, which did not engage in these hairstyling practices, reported a substantially lower mean HIT-6 score (51.1 ± 5.7) and lower prevalence of significant headache (61.4%), suggesting that the mechanical forces exerted by tight hairstyles and layered hijabs may contribute materially to headache burden. These findings align with prior research showing that external compression, tension, and traction exerted on the scalp and neck tissues can provoke extracranial headaches, including ponytail headache and cervicogenic headache (10). Moreover, the observation that participants in the hijab group aged 16–21 years exhibited composite symptom scores comparable to the older ponytail group underscores the possibility that such hairstyling-related headaches may manifest independently of age and cumulative exposure, suggesting an acute mechanobiological effect rather than a solely chronic one.

The significant association observed between headache presence and neck pain reinforces the close anatomical and physiological relationship between cervical musculoskeletal dysfunction and headache pathogenesis. Literature has documented a strong link between neck pain and primary headache disorders, particularly migraine and tension-type headache, with shared nociceptive pathways implicated in converging pain signals from cervical structures and cranial tissues (11). Our findings corroborate this relationship, as individuals reporting neck pain were substantially more likely to report significant headaches, highlighting the potential clinical relevance of screening for neck pain symptoms in individuals presenting with headache who wear tight hairstyles or hijabs. Interestingly, neither the number of hours per day nor the total years participants reported wearing hijabs or ponytails was significantly associated with headache prevalence, suggesting that even relatively short-term or moderate daily exposures may suffice to trigger headaches in susceptible individuals. This lack of duration-effect relationship contrasts with some previous studies in occupational populations where cumulative exposure (e.g., prolonged helmet wearing) was positively associated with headache incidence (12). One possible explanation is that among young women, the combination of tightly fixed hairstyles, additional layers of fabric, and frequent adjustment during the day may lead to transient but intense mechanical stress, sufficient to precipitate headaches even when cumulative duration is moderate.

The greater burden of symptoms observed in the ponytail group compared to the hijab group may reflect differences in the biomechanical forces transmitted through hair and scalp. Tight ponytails exert direct traction on hair follicles and the superficial fascia of the scalp, creating focal tension concentrated around the hairline and occipital region, whereas hijab-related pressure may be more diffusely distributed across the scalp and neck due to scarf wrapping techniques and the use of undercaps and accessories (13). This distinction could partially explain why ponytail wearers demonstrated marginally higher HIT-6 scores and NPRS neck pain scores compared to hijab wearers in our study. A notable strength of our study was the use of validated, standardized outcome measures (HIT-6 and NPRS), allowing robust quantification of headache impact and neck pain intensity in a culturally relevant population. Additionally, our stratified analysis by age group revealed that younger hijab wearers (16–21 years) had symptom burdens comparable to older ponytail wearers, suggesting that vulnerability to hairstyle-related headaches may emerge early and should be addressed proactively in clinical settings. However, limitations include the cross-sectional design, which precludes causal inference, and the use of convenience sampling, which may introduce selection bias and limit generalizability. Furthermore, we did not include objective assessments of scalp tension, cervical posture, or musculoskeletal function, which could have strengthened the mechanistic interpretation of our findings. Future research should explore whether ergonomic adjustments to hijab and ponytail styling—such as reducing tightness, repositioning ponytails to lower positions, or using softer undercaps—could mitigate headache and neck pain symptoms. Longitudinal studies are needed to determine whether symptom burden accumulates with chronic exposure and to identify individual susceptibility factors, such as pre-existing headache disorders or variations in scalp sensitivity. Additionally, given the cultural importance of hijab and ponytail styling practices, culturally sensitive clinical guidelines and education campaigns could be developed to inform women about potential headache risks while respecting personal and religious expression. In conclusion, our findings contribute to a growing body of evidence suggesting that hairstyling practices involving

mechanical traction and compression, such as modern hijab and tight high ponytails, are significantly associated with increased prevalence and severity of headache and neck pain in young women. Clinicians should inquire about such practices in patients presenting with headaches, and preventive strategies could be considered for at-risk individuals to reduce symptom burden and improve quality of life (14).

CONCLUSION

This study concludes that young women who regularly wear a modern hijab or style their hair in a high, tight ponytail experience a significantly higher prevalence and severity of headache and neck pain compared to those who do not engage in these practices. Both groups exhibited elevated HIT-6 scores and high proportions of clinically significant headaches, with the ponytail group showing the highest symptom burden overall. The strong association observed between headache presence and neck pain further supports the interconnected pathophysiology of these conditions, underscoring the relevance of cervical musculoskeletal factors in patients presenting with headache symptoms. Notably, headache prevalence did not correlate with the number of hours or total years of hijab or ponytail use, suggesting that even moderate daily exposure can result in clinically meaningful symptoms. These findings highlight the need for heightened clinical awareness of hairstyle-related headache syndromes and support further research into ergonomic modifications and educational interventions to mitigate this potentially modifiable risk factor in culturally appropriate ways.

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