

## Respiratory and Musculoskeletal Symptoms Combined with Reproductive Outcomes among Female Hairdressers: A Screening Study in Palestine

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**Abstract: Background:** Female hairdressers are frequently exposed to a mixture of hazardous chemicals, which could impact their health. However, studies on this occupational exposure in Palestine are limited. This study aimed to assess the prevalence of respiratory, musculoskeletal, and reproductive symptoms among female hairdressers in Nablus, Palestine, and to examine their association with work duration. **Methods:** A cross-sectional study was conducted among 310 randomly selected female hairdressers from Nablus, using standardized assessment tools. Self-reported respiratory, musculoskeletal, and reproductive symptoms were collected and analyzed. **Results:** Among participants, 34.8% reported shortness of breath, 26.1% had a cough, and 23% experienced hand dermatitis. Musculoskeletal symptoms were highly prevalent, with neck pain (71.9%), shoulder pain (68.4%), and back pain (68.1%) being most common. Abortions were reported by 26.5% of participants. A significant association was found between work duration and respiratory symptoms such as wheezing and cough ( $P=0.029$ ,  $0.032$ ), as well as musculoskeletal pain in shoulders, elbows, hands, and wrists ( $P=0.047$ ,  $0.007$ ). No significant association was found between work duration and reproductive symptoms. **Conclusion:** Occupational safety improvements are recommended for female hairdressers, including better awareness and use of protective equipment, and promoting safe handling of chemicals.

**Keywords:** Female hairdressers, Respiratory symptoms, Musculoskeletal symptoms, Reproductive outcomes, Occupational safety.

### BACKGROUND

Hairdressing is a widely practiced profession, particularly among females, employing millions worldwide [5; 8]. Hairdressers provide services such as hairstyling, coloring, shampooing, and cutting, which expose them to a range of harmful agents. These include chemical agents in hair products like dyes, permanent wave solutions, and bleaches, as well as ergonomic hazards associated with poor posture and extended working hours [8; 18; 19].

Chemicals commonly used in hairdressing include formaldehyde in shampoos, ammonium compounds in conditioners, ethanol in hair sprays, persulfate salts in bleaches, and hydrogen peroxide in emulsions and creams, among others [13; 20]. Many of these chemicals are known irritants or sensitizers, leading to respiratory symptoms such as chronic bronchitis, rhinitis, dyspnea, cough, phlegm, and occupational asthma [12; 16].

Musculoskeletal disorders are also prevalent among hairdressers, often attributed to biomechanical, ergonomic, and psychosocial factors. Symptoms include pain in the neck, wrists, hands, lower back, shoulders, and other areas [2; 8; 14]. Prolonged standing, use of vibrating tools, and awkward body postures significantly contribute to these musculoskeletal issues [8].

Additionally, female hairdressers are at a higher risk of reproductive health problems, including menstrual irregularities,

infertility, spontaneous abortion, low birth weight, and preterm delivery [7; 9; 17].

In Palestine, there is limited information on the prevalence of occupationally related symptoms among hairdressers. Given the conservative nature of Palestinian society, female customers primarily visit salons run by female hairdressers [1]. As a result, female hairdressers are at risk of significant health issues, including respiratory, musculoskeletal, and reproductive health outcomes.

The primary objective of this study is to assess the prevalence of respiratory, musculoskeletal, and reproductive symptoms among female hairdressers in Nablus, Palestine, and to investigate the association of these symptoms with work duration. This study aims to address the gap in the literature regarding occupational health risks among hairdressers in the Arab world and contribute to targeted interventions to improve workplace safety.

### METHODS

**Study Design and Population:** This cross-sectional study was conducted in Nablus, a major city in the Northern West Bank, Palestine. Given the limited regional data specific to Palestine, the sample size was estimated using an expected prevalence of 28%, based on data from a neighboring country, Egypt, which shares demographic and cultural similarities with the Palestinian hairdressing community [4]. The calculated sample size was 310 participants, which was sufficient to

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achieve a study power of 80% and a confidence level of 95% with a significance level of 0.05.

The study population consisted of female hairdressers officially registered with the Palestinian Association of Hairdressers in Nablus (N = 633). A proportionate stratified random sampling method was used to select participants, with stratification based on different regions of the city to ensure representative coverage. The selected regions and corresponding proportions were: Rafidia (25%), Al-Makhfiye and Al-Jamea Street (5%), Al-Jabal Al-Shamali and Al-Maajeen (30%), Ras Al-Ein (10%), Al-Masaken (5%), Downtown Nablus (15%), and Nablus Al-Jadeeda (10%). Hairdressers were eligible for inclusion if they had been working for at least one year and were aged between 18 and 50 years. Pregnant hairdressers were excluded from the study.

**Survey Instrument:** Data collection was carried out using standardized questionnaires. Respiratory symptoms were assessed using items from the American Thoracic Society's standardized questionnaire [6], which is well-regarded for its reliability in respiratory health research. Musculoskeletal and reproductive health symptoms were evaluated using the standardized Nordic questionnaire [11], known for its precision in capturing musculoskeletal complaints. Additional questions related to occupational tasks and exposures were adapted from a validated study on the Arab community [15]. This approach ensured comprehensive and contextually relevant data collection. The questionnaire consisted of three main sections, Personal and Socio-demographic Information: Age, marital status, education level, place of residence, smoking status, Occupational Exposure History: Frequency of hairdressing procedures per week, use of personal protective equipment (PPE), availability of ventilation systems. Health Symptoms: Self-reported respiratory symptoms (e.g., wheezing, cough, shortness of breath), musculoskeletal symptoms (e.g., neck pain, back pain), and reproductive health issues (e.g., infertility, low birth weight) experienced in the past 12 months.

**Ethical and Administrative Procedures:** The study was approved by the Institutional Review Board (IRB) of An-Najah National University (Approval No. 5, May 2018). Permission was also obtained from the Association of Hairdressers office in Nablus to facilitate the study. An explanatory letter was attached to each questionnaire, detailing the study's aim, importance, confidentiality, and voluntary nature of participation. All procedures were conducted in accordance with the Declaration of Helsinki.

**Data Analysis:** Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 16). Descriptive statistics, including frequencies and percentages, were used to summarize the data. Chi-square ( $\chi^2$ ) tests were used to examine the association between categorical variables, including work duration and reported symptoms. Statistical significance was set at  $P < 0.05$ .

## RESULTS

### Demographic and Occupational Profile of Participants:

The majority of female hairdressers in the study were in their twenties and married (48.7%,  $n=151$ ). Most had completed

secondary education or held a diploma and were residents of urban areas (Table 1). A significant percentage (96.5%) reported using gloves during work, while 29% used masks, and none used goggles (Table 1).

**Occupational History and Exposure:** Approximately 27% of participants reported working for 1-3 years, while 26.8% and 26.1% had work experience of 4-6 years and 7-9 years, respectively. The majority (71.6%) worked 6-9 hours per day, and 74.8% worked 4-6 days per week. The most frequent task was cutting, dyeing, and bleaching hair (54%), followed by cutting alone (20%). Hair dyes were the most commonly used product (51%), followed by hairsprays and shampoos (17.4% each). The work frequently involved strenuous shoulder movements (75.5%), prolonged standing (86.5%), and awkward body postures (85.5%) (Table 1).

**Table (1):** Demographic and Occupational Characteristics of Study Participants.

Demographic Characteristics	N (%)
<b>Age (years)</b>	
18-23	68 (21.9)
24-29	108 (34.8)
30-35	55 (17.7)
36-41	37 (11.9)
≥ 42	42 (13.5)
<b>Marital Status</b>	
Single	145 (46.8)
Married	151 (48.7)
Others (divorced or widow)	14 (4.5)
<b>Level of Education</b>	
Primary education or less	36 (11.6)
Secondary education	117 (37.7)
Diploma	129 (41.6)
BA	28 (9.0)
<b>Place of Residence</b>	
Refugee camp	7 (2.3)
Village	46 (14.8)
City	257 (82.9)
<b>Smoking Status</b>	
Non- smoker	109 (35.2)
Ex-smoker	8 (2.6)
Smoker	193 (62.3)
<b>Use of Personal Protective Equipment</b>	
<b>Gloves</b>	
Yes	299 (96.5)
No	11 (3.5)
<b>Face Mask</b>	
Yes	90 (29.0)
No	220 (71.0)
<b>Eye Goggles</b>	
Yes	0
No	310 (100)

**Respiratory Symptoms and Work Duration:** The most common respiratory symptom among female hairdressers was related to item 4: "Have you had an attack of shortness of breath that came on after you stopped exercise at any time in the last 12 months?" (18.4%,  $n=57$ ). The least common symptom was related to item 9: "Have you brought up phlegm from your chest like this most mornings for at least 3 months each year?" (3.5%,  $n=11$ ) (Table 2). Chi-square analysis showed statistically significant differences in respiratory symptoms related to questions 1 and 7 based on work duration, with those working 4-6 years experiencing more symptoms. Additionally, significant differences were noted for question 6, favoring those with 7-9 years of experience (Table 2).

**Table (2):** General Respiratory Symptoms by Working Years.

Respiratory Symptom Question	Total N (%)	(1-3) Years N (%)	(4-6) Years N (%)	(7-9) Years N (%)	(≥10) Years N (%)	p-value
Wheezing or whistling in the chest in the last 12 months	44 (14.2)	5 (11.4)	16 (36.4)	10 (22.7)	13 (29.5)	0.029
Woken up with tightness in the chest first thing in the morning in the last 12 months	36 (11.6)	5 (13.9)	12 (33.3)	12 (33.3)	7 (19.4)	0.252
Attack of shortness of breath during the day without doing anything strenuous in the last 12 months	26 (8.4)	8 (30.8)	3 (11.5)	8 (30.8)	7 (26.9)	0.319

Respiratory Symptom Question	Total N (%)	(1-3) Years N (%)	(4-6) Years N (%)	(7-9) Years N (%)	(≥10) Years N (%)	p-value
Attack of shortness of breath after stopping exercise in the last 12 months	57 (18.4)	12 (21.1)	12 (21.1)	15 (31.6)	15 (26.3)	0.263
Woken at night by an attack of shortness of breath in the last 12 months	31 (10.0)	6 (19.4)	5 (16.1)	12 (38.7)	8 (25.8)	0.180
Woken at night by an attack of coughing in the last 12 months	39 (12.6)	3 (7.7)	12 (30.8)	14 (35.9)	10 (25.6)	0.032
Usual morning cough	27 (8.7)	2 (7.4)	10 (37.0)	6 (22.2)	9 (33.3)	0.042
Bringing up phlegm from chest first thing in the morning	21 (6.8)	2 (9.5)	4 (19.0)	8 (38.1)	7 (33.3)	0.098
Bringing up phlegm most mornings for at least 3 months each year	11 (3.5)	0 (0.0)	4 (36.4)	3 (27.3)	4 (36.4)	0.171

\*Chi-square test at a significance level of  $p < 0.05$ .

**Musculoskeletal Symptoms and Work Duration:** Neck pain was the most common musculoskeletal symptom reported in the past 12 months (71.9%,  $n=223$ ), while knee pain was the least common (26.5%,  $n=82$ ) (Table 3). Chi-square analysis revealed significant differences in shoulder, elbow, hand, and

wrist pain among hairdressers based on work duration, favoring those with 7-9 years of experience. Knee pain was significantly more prevalent among those with  $\geq 10$  years of experience. No significant differences were found in other musculoskeletal symptoms according to work duration (Table 3).

**Table (3):** Musculoskeletal Symptoms by Working Years.

Musculoskeletal Symptom Question	Response	Total N (%)	(1-3) Years N (%)	(4-6) Years N (%)	(7-9) Years N (%)	(≥10) Years N (%)	p-value
Neck pain	Yes	223 (71.9)	54 (24.2)	59 (26.5)	62 (27.8)	48 (21.5)	0.237
Neck pain	No	87 (28.1)	30 (34.5)	24 (27.6)	19 (21.8)	14 (16.1)	
Shoulder pain	Yes	212 (68.4)	50 (23.6)	53 (25.0)	61 (28.8)	48 (22.6)	0.047
Shoulder pain	No	98 (31.6)	34 (34.7)	30 (30.6)	20 (20.4)	14 (14.3)	
Elbow, hand, and wrist pain	Yes	125 (40.3)	26 (20.8)	27 (21.6)	38 (30.4)	34 (27.2)	0.007
Elbow, hand, and wrist pain	No	185 (59.7)	58 (31.4)	56 (30.3)	43 (23.2)	28 (15.1)	
Back pain	Yes	211 (68.1)	51 (24.2)	60 (28.4)	54 (25.6)	46 (21.8)	0.271
Back pain	No	99 (31.9)	33 (33.3)	23 (23.2)	27 (27.3)	16 (16.2)	
Knee pain	Yes	82 (26.5)	10 (12.2)	12 (14.6)	28 (34.1)	32 (39.0)	0.001
Knee pain	No	228 (73.5)	74 (32.5)	71 (31.0)	53 (23.1)	30 (13.2)	
Leg and foot pain	Yes	188 (60.6)	49 (26.1)	50 (26.6)	45 (23.9)	44 (23.4)	0.279
Leg and foot pain	No	122 (39.4)	35 (28.7)	33 (27.0)	36 (29.5)	18 (14.8)	

Chi-square test at a significance level of  $p < 0.05$ .

Participants were also asked about musculoskeletal symptoms that led to medical visits or sick absenteeism in the past year. Neck pain was the leading cause of medical visits (16.5%,  $n=51$ ), while leg and foot pain were the least reported (5.8%,  $n=18$ ). Back pain was the most frequent cause of sick absenteeism (9.7%,  $n=30$ ), and leg and foot pain were the least common (2.6%,  $n=8$ ) (Table 4).

**Table (4):** Musculoskeletal Symptoms Leading to Doctor Visits and Sick Absenteeism.

Musculoskeletal Symptom	Yes N (%)	No N (%)
<b>Symptoms leading to Visit a doctor</b>		
Neck pain.	51 (16.5)	259 (83.5)
Shoulder pain.	44 (14.2)	266 (85.8)
Elbow, hand and wrist pain.	30 (9.7)	280 (90.3)
Back pain.	45 (14.5)	265 (85.5)
Knee pain.	21 (6.8)	289 (93.2)
Leg and foot pain.	18 (5.8)	292 (94.2)

Musculoskeletal Symptom	Yes N (%)	No N (%)
<b>Symptom Leading to sick absenteeism</b>		
Neck pain.	21 (6.8)	289 (93.2)
Shoulder pain.	23 (7.4)	287 (92.6)
Elbow, hand and wrist pain.	20 (6.5)	290 (93.5)
Back pain.	30 (9.7)	280 (92.3)
Knee pain.	11 (3.5)	299 (96.5)
Leg and foot pain.	8 (2.6)	302 (97.4)

**Reproductive Outcomes and Work Duration:** Among the married female hairdressers (48.7%,  $n=151$ ), abortion was the most commonly reported reproductive outcome in the past 12 months (26.5%,  $n=40$ ), whereas fetal death was the least common (3.3%,  $n=5$ ) (Table 5). Chi-square analysis revealed no statistically significant differences in reproductive outcomes based on work duration (Table 5).

**Table (5):** Reproductive Symptoms by Working duration.

No.	Reproductive Symptoms	Response	Total N (%)	Working Years				P- value*
				(1- 3) years (n= 84) N (%)	(4- 6) years (n= 83) N (%)	(7- 9) years (n= 81) N (%)	(≥10) years (n= 62) N (%)	
Q1.	Infertility	Yes	10 (6.6)	1 (10)	3 (30)	3 (30)	3 (30)	0.808
		No	141 (93.4)	28 (19.9)	31 (22)	33 (43.4)	49 (34.8)	
Q2.	Usage of IVF technique.	Yes	9 (6)	1 (11.1)	3 (33.3)	2 (22.2)	3 (33.3)	0.840
		No	142 (94)	28 (19.7)	31 (21.8)	34 (23.9)	49 (34.5)	
Q3.	Low birth weight	Yes	15 (9.9)	2 (13.3)	4 (26.7)	1 (6.7)	8 (53.3)	0.239
		No	136 (90.1)	27 (19.9)	30 (22.1)	35 (25.7)	44 (32.4)	
Q4.	Fetal death	Yes	5 (3.3)	2 (40)	0 (0)	0 (0)	3 (60)	0.208
		No	146 (96.7)	27 (18.5)	34 (23.3)	36 (24.7)	49 (33.6)	
Q5.	Abortion	Yes	40 (26.5)	7 (17.5)	10 (25)	12 (30)	11 (27.5)	0.602
		No	111 (73.5)	22 (19.8)	24 (21.6)	24 (21.6)	41 (36.9)	
Q6.	Preterm delivery	Yes	7 (4.6)	1 (14.3)	1 (14.3)	1 (14.3)	4 (57.1)	0.638
		No	144 (95.4)	28 (19.4)	33 (22.9)	35 (24.3)	48 (33.3)	

\*Chi-square test at a significance level of  $p < 0.05$ .

## DISCUSSION

This study represents a pioneering effort to explore occupational hazards and safety practices within the

hairdressing industry in the Arab world, a subject largely overlooked in current literature. Our findings provide insight into the demographic characteristics of female hairdressers in Palestine, who are predominantly young, educated urban

women in their twenties. Their work routines, including tasks and products used, are similar to those reported in a related Turkish study [12], suggesting the universality of certain salon practices.

The physical demands inherent in hairdressing present notable risks for musculoskeletal health, as evidenced by the high prevalence of discomfort and pain among participants, particularly in the neck, shoulders, and back. This aligns with previous findings, which also emphasize the ergonomic challenges faced by hairdressers [14]. While our study indicates good adherence to glove usage, the limited use of masks and goggles raises concerns about respiratory and dermatological risks, a challenge highlighted in similar studies (8;15).

Respiratory symptoms were common among participants, particularly shortness of breath, which was frequently reported following exposure to hair products such as dyes and bleach. These findings are consistent with those of Hassan and Bayomy (2015) and Bradshaw et al. (2011), underscoring the elevated risk of respiratory diseases among hairdressers due to prolonged exposure to chemical irritants. Notably, our results demonstrate significant associations between symptom prevalence and longer work duration, indicating cumulative adverse effects from sustained exposure to occupational hazards.

Musculoskeletal symptoms were also strongly correlated with the duration of employment, with neck, shoulder, and back pain being the most common complaints. These results are partially consistent with a study conducted in Brazil, which reported shoulder pain as the most common musculoskeletal issue [14]. Differences in symptom prevalence may be attributed to factors such as workspace ergonomics, including chair height and limited maneuvering space, which significantly impact posture and comfort.

Reproductive health outcomes, specifically abortion and low birth weight, were also noteworthy findings. Our results are in line with a Finnish study [7] that reported an increased risk of low birth weight among hairdressers compared to a control group. Interestingly, no statistically significant association was observed between years of employment and reproductive symptoms among married participants, which diverges from findings in a meta-analysis [9]. This may be due to cultural factors influencing the study population.

## CONCLUSION AND RECOMMENDATIONS

The observed association between extended work hours and the prevalence of respiratory and musculoskeletal symptoms suggests that prolonged exposure to salon chemicals and sustained physical postures contribute significantly to health risks. This highlights the necessity for longitudinal studies to further explore these relationships and establish causal links. Our findings underscore the urgent need for policy interventions aimed at mitigating these health risks through mandatory safety training, improved use of personal protective equipment, and ergonomic improvements in the workplace.

## Disclosure Statements

- **Consent for publishing:** Not applicable.
- **Availability of data and materials:** Data are all contained within the article.
- **Authors' contributions:** "HA and RA designed the study protocol. HA coordinated the study protocol. RA collected the data. IT, HA and RA conducted the statistical analysis. HA, RS, IT, RA, RZ and AA drafting the manuscript. All authors read, review and approved the final manuscript."

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