Occupational respiratory morbidity and associated factors among hairdressers in Ethiopia: a cross-sectional study

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ABSTRACT

Objective This study was designed to determine the prevalence and factors associated with occupational respiratory morbidity among hairdressers in Northwestern Ethiopia.

Design A cross-sectional study was conducted from 6 July 2022 to 17 August 2022. The data were collected using a standardised American Thoracic Society questionnaire. The collected data were entered into EpiData V.4.6 and analysed using Stata V.14. A multivariable logistic regression analysis was conducted to identify factors associated with occupational respiratory morbidity. The association was determined using an adjusted OR (AOR) with a 95% CI at a p value of <0.05.

Setting The study was conducted in Gondar city, Northwestern Ethiopia.

Participants A total of 403 hairdressers participated in this study.

Outcome measures The primary outcome is the prevalence of occupational respiratory morbidity.

Results The total response rate was 95.5%. The majority, 250 (62%) of the respondents were women. The mean age (±SD) of the respondents was 27 (±6.0) years. The overall prevalence of occupational respiratory morbidity during the past 12 months was found to be 134 (33.3%) (95% CI (28.7% to 38.1%)). Female hairdressers (18.6%) showed greater respiratory morbidity than male hairdressers (14.7%). Working experience 3–5 years (AOR: 3.05; 95% CI (1.33 to 3.37)) and working near roadsides (AOR: 3.23 (95% CI (2.73 to 14.16)), overweight (body mass index (BMI)) (AOR: 3.01; 95% CI (1.19 to 7.58)) and working near roadsides (AOR: 2.15; 95% CI (1.33 to 3.37)) were risk factors of occupational respiratory morbidity among hairdressers.

Conclusions This study concluded that one-third of hairdressers experienced occupational respiratory morbidity. Longer work experience, higher BMI and working near roadsides were identified as significant risk factors for respiratory morbidity in hairdressers. Dietary calorie restrictions for overweight individuals and the development and implementation of air pollution mitigation measures targeted at roadside workers are advised to curb the problem.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study is the first of its kind in investigating the prevalence and factors associated with occupational respiratory morbidity among hairdressers in Ethiopia.
⇒ The study focused on subgroups of the working population at risk of respiratory morbidity where occupational exposures are unregulated and working conditions are substandard.
⇒ The results might be limited by recall bias due to its reliance on participants’ self-reported data.
⇒ As well, due to its cross-sectional design, this study could not show a temporal relationship.

INTRODUCTION

Occupational respiratory morbidity is defined as the presence of one or more symptoms such as coughing, shortness of breath, chest pain, chest tightness and abnormal breathing patterns caused by repeated long-term exposure to a hazardous agent at work. Hairdressers are among the occupational groups most affected by respiratory morbidity. Hairdressers are individuals who work in salons and provide services related to hair styling, colouring, shampooing, cutting, facial makeup, manucures and pedicures. Hairdressers are an expanding part of the small and medium enterprise sector of the economy as the demand for beauty and personal care products is rapidly increasing. Hairdressers are part of the informal economy, where workloads are not regulated and working conditions are substandard. In providing their services, hairdressers regularly handle a variety of products, such as hair dyes, bleaches, shampoo, tints, conditioners and hair sprays, over long periods. These chemicals are known to have irritant and sensitising effects on the airways that can predispose them to respiratory morbidity and affect lung function. According to WHO, respiratory morbidity is the third highest killer worldwide, causing 3.23 million deaths in 2019, and it is the seventh leading cause of poor health worldwide (measured by disability-adjusted life years, DALYS).
years). More than 90% of deaths occur in low-income and middle-income countries.\textsuperscript{9–11} Epidemiological studies have identified high-risk jobs and hazardous exposures.\textsuperscript{10} In low-income countries, including Ethiopia, where most patients have access to poor healthcare services, occupational respiratory morbidities are emerging as public health problems.\textsuperscript{12}

Investigations have confirmed that the prevalence of occupational respiratory morbidity is higher in hairdressers compared with other occupations.\textsuperscript{13,14} According to the sparse research findings, the prevalence of respiratory morbidity in hairdressers is high, with prevalence rates ranging from 19% in India\textsuperscript{15} to 40% in Indonesia\textsuperscript{10} and 57% in Saudi Arabia.\textsuperscript{16} A study in Utah, USA,\textsuperscript{17} found that hairdressers had a higher prevalence of cough, dyspnoea and wheezing (12%) than the non-occupationally exposed control group (7.6%). A study in Lagos, Nigeria,\textsuperscript{18} revealed that the most common respiratory morbidity among hairdressers was sneezing (75.9%), coughing (50.9%) and chest tightness (37.7%). In Ethiopia, where the working environment is very poor, occupational respiratory disease ranges from 27.09%\textsuperscript{19} to 68.89%\textsuperscript{20} in different occupational subgroups, except for hairdressers due to a lack of study. Occupational respiratory morbidity in hairdressers is increased by several factors.\textsuperscript{10,14,15} These workers are exposed to indoor and outdoor air pollution, allergens, workplace chemicals, tobacco smoke and confined spaces regularly and for prolonged periods. Exposure to chemicals may persist in most beauty salons due to inadequate ventilation, increasing the effective exposure duration. There is a lack of training on safety measures and the use of personal protective equipment (PPE) that may further increase exposure susceptibility. Exposure to toxic chemicals used in beauty salons can also be exacerbated by poorly labelled products and limited information about their safety. Even though hairdressers face numerous occupational hazards, only a few occupational safety regulations are in place. Many of the chemicals used in hair and beauty salons are known to have adverse effects on the respiratory system, with exposure often exacerbated by the aforementioned factors.\textsuperscript{21–23} There is also strong evidence associating respiratory morbidity with living near roads with heavy traffic.\textsuperscript{24}

In the Ethiopian context, the Ethiopian Labour Proclamation No. 1156/2019 enforces the legal duty of the employer to safeguard workers from accidents and injuries, including the provision of occupational health services (OHS). The proclamation states that the Ministry of Labour and Skills of Ethiopia is responsible for managing OHS issues in Ethiopia.\textsuperscript{25} However, exposure to occupational health hazards has increased with the expansion of various industries in the country as Ethiopia moves rapidly towards industrialisation to alleviate poverty.\textsuperscript{26,27} The workers had a minimal level of health and safety protection and worked in hazardous conditions in every industry.\textsuperscript{27} In addition, as much of the work in Ethiopia is established under informal conditions, workers in these sectors are not covered by national labour and other regulations, which can be difficult for regulators to access.\textsuperscript{28} Moreover, little attention has been paid to the implementation and enforcement of health and safety programmes, particularly in informal sectors such as hairdressing.\textsuperscript{29} As a result, every worker is vulnerable to a wide range of occupational and environmental hazards that can cause serious injury, morbidity and mortality.

Despite the increasing number of hairdressing salons and the susceptibility of workers to a variety of respiratory diseases at their workplace, there are few epidemiological studies on occupational respiratory morbidity in hairdressers, although these have focused on developed countries. In developing countries such as Ethiopia, the scope of the problem and the conditions that lead to respiratory morbidity among hairdressers are unknown. There has never been a study done on respiratory diseases among hairdressers in Ethiopia. To fill these gaps, the present study was conducted in Gondar city, Northwestern Ethiopia, to determine the prevalence and factors associated with respiratory morbidity among hairdressers. The results of this study provide evidence for the development of a policy, strategy and framework for respiratory disease prevention and control programmes in hairdressers.

METHODS AND MATERIALS

Study design and period

A workplace cross-sectional study was conducted in Northwestern Ethiopia from 6 July 2022 to 17 August 2022, to assess the prevalence and associated factors of occupational respiratory morbidity among hairdressers.

Study setting and area

The study was carried out among Gondar city beauty salon hairdressers. The city is one of the tourist destinations in the Amhara Regional State, which is located in the north-west of Ethiopia and 747 km away from the capital Addis Ababa. Gondar is located at latitude 12°36’N and longitude 37°28’E, and is at an altitude of 2133 metres above sea level.\textsuperscript{30} According to the 2013 report of the Ethiopian Central Statistical Agency, the population of the city was estimated at 323,875 in 2015 and increased to 360,600 in 2017. The city is divided into 24 ‘kebeles’, each of which is subdivided into several ‘ketenas’, which represent the lowest urban administrative units. Throughout the study period, there were 2012 hairdressing professionals in all kebeles, of whom 1163 were barbershop employees.

Source and study populations

The source populations were all female beauty salon hairdressers and barbershop employees in Gondar city. On the other hand, the randomly selected female and male hairdressers in the selected sub-cities formed our study population.

Inclusion and exclusion criteria

Female and male hairdressers who had worked in the study area for at least 12 months before the study were
included in the study, while those who suffered from asthma, chest injury, chest surgery, heart disease, tuberculosis or other respiratory disorders diagnosed by a physician before starting work were excluded because they could potentially bias the results of our study.

Sample size determination and sampling technique
The sample size was calculated using a single population proportion formula32 by considering the following statistical assumptions: \( Z_{\alpha/2} = \text{the value of the standard normal curve score corresponding to the given CI, proportion (p) of occupational respiratory morbidity} = 50\% \) since there has been no previous research in the country in a similar context and margin of error (d) = 5\%. Using the single proportion formula: 
\[
n = \left( \frac{Z_{\alpha/2}}{d} \right)^2 \frac{p(1-p)}{\text{proportion}}
\]
where \( n \) is the initial sample size, \( Z \) is 1.96, the corresponding \( Z \)-score for the 95\% CI, \( p \) is the proportion of respiratory symptoms, which is 0.5 and \( d \) is the margin of error, which is 0.05. Then: 
\[
n = \left( \frac{1.96}{0.05} \right)^2 \frac{0.5(1-0.5)}{0.05^2} = 384.
\]
Assuming a 10\% response rate, the final sample size was 384+38 = 422. A systematic random sampling technique was used to recruit eligible samples. When there were two or more hairdressers in a beauty salon, they were chosen by lottery.

Variable measurement and definition of terms
Hairdressers
In this study, ‘hairdressers’ means employees who were employed in female and male hairdressing establishments and performed any of the following work: head shaving, haircutting, hair removal, hairdressing, hair trimming, hair curling or waving, hair singeing, shampooing, wig making, hair working, and hair dyeing or colouring.

Occupational respiratory morbidity
It was the primary outcome variable of our study and was measured using the American Thoracic Society (ATS) questionnaire.33 It was counted if the hairdressers reported one or more symptoms of cough, phlegm, wheezing, shortness of breath or chest tightness caused by their occupation for at least 3 months in the previous 12 months.34

Body mass index
Weight in kilograms divided by the square of the height in metres (kg/m²), categorised as underweight=body mass index (BMI) <18.5, normal=BMI 18.5–24.9, overweight=BMI ≥ 25.

Never smokers
Hairdressers who have never smoked cigarettes.

Ex-smoker
Hairdressers who had quit smoking at least 1 year before the survey.

Current smokers
Hairdressers who smoked at the time of the study or had stopped smoking less than 1 year before.

Passive smokers
Hairdressers who inhale smoke released from the burning end of a cigarette (or other burned tobacco product) between puffs (sidestream smoke) and smoke exhaled by other smokers (exhaled mainstream smoke).

Never drinker
Employees who have never drunk alcohol, including locally brewed beverages.

Rarely drinker
Employees who consumed alcohol less than once in the past 12 months.

Regularly drinkers
Employees who consumed alcohol one to four times per week.

Khat chewer
Personnel who have been chewing khat three times a week for 1 year.

Doing physical exercise
Personnel who are doing any kind of sports activity at least two times per week with a duration of at least 30 min.

Beauty salons located away from roads
Hair salons located at least 300 metres away from asphalt roads.35

Presence of window
A window that is open during working hours.

PPE use
The use of one or more respiratory masks, full-face respirators or breathing apparatus.

Data collection tools
Data were collected using a standardised interviewer-administered questionnaire after the investigators reviewed and modified various relevant literature based on the study objectives. The questionnaire was originally designed in English and then translated into Amharic, the local language of the study area. The questionnaire consisted of five sections. The first section of the questionnaire focused on socio-demographic factors such as gender, age, marital status, education level, work experience and monthly salary. The second section of the questionnaire focused on the assessment of occupational respiratory morbidity in hairdressers. The data were collected using a standardised ATS questionnaire.35 The ATS questionnaire has been used repeatedly in previous studies conducted among different working groups in the country and adapted to local culture and conditions.34 36 The third section of the questionnaire consisted of information to assess behavioural characteristics such as cigarette smoking, alcohol consumption, khat chewing, passive smoking and physical activity. The fourth section of the questionnaire consisted of a list of questions designed to collect data on the housing conditions of the
hairdressers, such as the building materials of the house, the presence of windows in the house, the type of fuel used for cooking, the location of cooking and the presence of windows in the kitchen. The final section of the questionnaires focused on the assessment of the work-related characteristics of hairdressers, including daily working hours, the distance of the hairdressing salon from the street, the presence of windows in the hairdressing salon, the use of PPE and the presence of artificial ventilation in the workplace.

Data collection procedure
Data were gathered using a pretested and structured Amharic version of a questionnaire through face-to-face interviews with the study participants after obtaining ethical clearance from the Institutional Ethical Review Board of the University of Gondar and written informed consent from study participants. Based on the results of the pretest, necessary modifications were made to the questions, and participants involved in the pretest were excluded from the actual data analysis. Data collection was administered by trained data collectors after 2 days of training.

Data quality control
To ensure consistency, the questionnaire was first developed in English and then translated into Amharic and back into English by the authors with the help of language experts. Second, we employed two data collectors and a supervisor with prior experience and knowledge of the data collection process. Data collectors and supervisors received 2 days of training and orientation before the actual data collection, covering issues such as clarity of questions, objectives of the study, confidentiality of information, informed consent and the roles and responsibilities of both data collectors and supervisors during the data collection process. The principal investigator supervised both the data collectors and the supervisor. Third, a pretest was conducted 1 week before the actual data collection period on 5% (21) of the sample size among hairdressers in Addis Zemen town, near Gondar city, to check the response, language clarity, appropriateness and consistency of the instrument. Based on the results of the pretest analysis, we modified some words and misinterpretations, minimised the number of questions and made corrections to the ambiguous questions. The pretest data were not included in the actual data analysis. Problems that arose during the data collection process were resolved through discussion with the principal investigator, supervisor, and data collectors.

Data management and statistical analysis
The collected data were checked for completeness. The accurate and complete data were then coded, labelled, categorised and entered into EpiData V.4.6 software. The entered data were further exported to Stata V.14 for additional analysis, and frequencies, percentages, means and SD were computed to present our findings. Before running the bivariable and multivariable binary logistic regression analyses, the variable’s normality, outliers and multicollinearity were checked. The assumption of multicollinearity was tested using a variance inflation factor, and all variables had values less than 5, indicating that there is no evidence of multicollinearity. The reliability of the ATS was tested using Cronbach’s alpha, which was found to be 0.82. According to Cronbach’s alpha, the reliability of an instrument is tolerable at a cut-off point of 0.65 and above. The instruments were, therefore, tolerable for their consistency in repeating what had previously been measured using these tools. A binary logistic regression analysis was performed to examine the association between dependent and independent variables. Variables with p-values of <0.2 in the bivariable logistic regression analysis were exported to a multivariable logistic regression to control the potential effects of confounders. A cut-off p value of <0.05 was set to evaluate the significance and ORs with a 95% CI to establish the strength and direction of associations in the multivariable logistic regression model. The Hosmer-Lemeshow test was used to determine the goodness-of-fit of a model, and it was found to be a good fit (p-value = 0.375).37

Patient and public involvement
Hairdressers participated in this investigation by contributing useful information. However, they have never been involved in the study design, protocol, data collection tools, reporting or dissemination of the findings. The findings of the study will be shared with the Gondar City Trade and Industry Department as well as through open-access publication.

RESULTS
Socio-demographic characteristics of the participants
A total of 422 hairdressers were invited to participate in the study, but data from 19 hairdressers were excluded from further analysis due to incomplete data. Complete data from 403 participants were analysed, giving a response rate of 95.5%. The majority, 250 (62%) of the participants were women. The mean age (±SD) of participants was 27 (±6.0) years, and more than half (55.1%) were single. The average (±SD) work experience of the surveyed workers in their current position was 3.5 (±2.5) years. Of the respondents, 111 (25.5%) had a monthly salary of less than US$36.8 and 145 (36%) had a salary of more than US$55.2 (Table 1).

Behavioural characteristics of the participants
The majority of respondents, 350 (86.8%), had a normal BMI (18.5–24.9 kg/m²), while 25 (6.2%) of them were overweight (>18.5 kg/m²). Only 28 (7.0%) of the hairdressers were current smokers. Regarding alcohol consumption, 249 (61.8%), 52 (12.9%) and 102 (25.3%) of the hairdressing workers never, rarely and regularly drank, respectively. Of the study participants, 157 (39.0%)...
reported that they engaged in physical activity at least twice a week (table 2).

### Housing conditions and work environment-related characteristics

Of the study participants, 158 (39.2%) of the respondents reported living in a house made of mud and wood. Ninety-seven (24.1%) households had no windows in their rental rooms. Of the sampled hairdressers, 145 (43.6%) used polluting energy sources (firewood, cow dung and charcoal) and more than half (53.0%) were cooked inside their homes (indoor cookers). One hundred sixty-four (40.7%) and 246 (61.0%) hairdressers worked more than 8 hours per day and 6 or more days per week, respectively. About half (51.4%) of the participants’ hair salons were located near the asphalt road (<300 metres from the road). The majority, 368 (91.3%) of the hairdressers, did not use PPE (respiratory masks, full-face respiratory apparatus or breathing apparatus) in their workplace, and 347 (86.1%) of the respondent’s workplaces further lacked artificial ventilation (table 3).

### Prevalence of occupational respiratory morbidity

In this study, the overall prevalence of occupational respiratory morbidity among Gondar city hairdressers during the past 12 months was 134 (33.3%) (95% CI (28.7% to 38.1%)). Female hairdressers (18.6%) showed greater respiratory morbidity than male hairdressers (14.7%); however, no significant difference was observed between them ($\chi^2=3.14; p$ value=0.077). Chief respiratory symptoms reported among sampled hairdressers were shortness of breath 27.8% (n=112), cough 22.8% (n=92), phlegm 22.1% (n=89), followed by chest tightness 21.8% (n=88) and wheezing 18.4% (n=74) as stated in figure 1.

### Factors associated with occupational respiratory morbidity

Bivariable and multivariable analyses were performed to identify independent factors associated with occupational respiratory morbidity using a binary logistic regression model. Types of hair salons, sex, marital status, age, work experience, secondhand cigarette smoke (passive smoking), BMI and location of the hair salon were the variables correlated with respiratory morbidity in the bivariable binary logistic regression analysis at a $p$ value of <0.2. However, after controlling for confounding variables in the multivariable binary logistic regression analysis ($p$<0.05), work experience, BMI and location of the hair salon from the road remained significant factors determining the occurrences of occupational respiratory morbidity among hairdressers.

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**Table 1** Socio-demographic factors of hairdressers in Northwestern Ethiopia, 2022 (N=403)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (n)</th>
<th>Per cent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of hair salon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female hair salon (n=478)</td>
<td>164</td>
<td>40.7</td>
</tr>
<tr>
<td>Barbershop (n=589)</td>
<td>239</td>
<td>59.3</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>153</td>
<td>38.0</td>
</tr>
<tr>
<td>Female</td>
<td>250</td>
<td>62.0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–29</td>
<td>290</td>
<td>72.0</td>
</tr>
<tr>
<td>30–39</td>
<td>99</td>
<td>24.6</td>
</tr>
<tr>
<td>≥40</td>
<td>14</td>
<td>3.4</td>
</tr>
<tr>
<td>Marital status</td>
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</tr>
<tr>
<td>Single</td>
<td>222</td>
<td>55.1</td>
</tr>
<tr>
<td>Married</td>
<td>181</td>
<td>44.9</td>
</tr>
<tr>
<td>Educational status</td>
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<td></td>
</tr>
<tr>
<td>No formal education</td>
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<td>13.1</td>
</tr>
<tr>
<td>Primary school (1–8 grade)</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>Secondary school (9–12 grade)</td>
<td>95</td>
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</tr>
<tr>
<td>Diploma and degree</td>
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<td>56.3</td>
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<tr>
<td>Working experience</td>
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<tr>
<td>≤2 years</td>
<td>163</td>
<td>40.4</td>
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<tr>
<td>3–5 years</td>
<td>184</td>
<td>45.7</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>56</td>
<td>13.9</td>
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<tr>
<td>Monthly salary (US$)</td>
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<tr>
<td>&lt;36.8</td>
<td>111</td>
<td>27.5</td>
</tr>
<tr>
<td>36.8–55.2</td>
<td>145</td>
<td>36.0</td>
</tr>
<tr>
<td>&gt;55.2</td>
<td>147</td>
<td>36.5</td>
</tr>
</tbody>
</table>

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**Table 2** Behavioural characteristics of hairdressers in Northwestern Ethiopia, 2022 (N=403)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (n)</th>
<th>Per cent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body mass index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>Normal</td>
<td>350</td>
<td>86.8</td>
</tr>
<tr>
<td>Overweight</td>
<td>25</td>
<td>6.2</td>
</tr>
<tr>
<td>Cigarette smoker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoker</td>
<td>291</td>
<td>72.2</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>84</td>
<td>20.8</td>
</tr>
<tr>
<td>Current smoker</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>Passive smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>74</td>
<td>18.4</td>
</tr>
<tr>
<td>No</td>
<td>329</td>
<td>81.6</td>
</tr>
<tr>
<td>Alcohol drinker</td>
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<td></td>
</tr>
<tr>
<td>Never drinker</td>
<td>249</td>
<td>61.8</td>
</tr>
<tr>
<td>Rarely drinker</td>
<td>52</td>
<td>12.9</td>
</tr>
<tr>
<td>Regularly drinker</td>
<td>102</td>
<td>25.3</td>
</tr>
<tr>
<td>Doing physical exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>157</td>
<td>39.0</td>
</tr>
<tr>
<td>No</td>
<td>246</td>
<td>61.0</td>
</tr>
</tbody>
</table>
The likelihood of suffering from occupational respiratory morbidity was increased by threefold among hairdressers who had between 3 and 5 years of work experience as compared with those who had 2 or fewer years of work experience (adjusted OR (AOR): 3.05; 95% CI (1.76 to 5.30)), while hairdressers who had more than 5 years of work experience were 6.22 times more likely to develop respiratory symptoms than those who had 2 or fewer years of work experience (AOR: 6.22; 95% CI (2.73 to 14.16)). The incidence of occupational respiratory morbidity was also significantly influenced by BMI in overweight individuals. Hairdressers with an overweight BMI were 3.01 times more likely to develop respiratory morbidity than hairdressers with a normal BMI (AOR: 3.01; 95% CI (1.19 to 7.58)). Moreover, the analysis of the current study indicated that hairdressers who worked in beauty salons near the asphalt road compared with those who worked in beauty salons far from the asphalt road had a 2.15 higher risk of having occupational respiratory morbidity (AOR: 2.15; 95% CI (1.33 to 3.37)) (Table 4).

DISCUSSION

Hairdressers are among the higher-risk occupational groups for respiratory problems due to unsafe working conditions, a lack of training and awareness, the use of different chemicals, a lack of regular monitoring and inspections and poor accessibility and use of PPE.15 38–41 In addition, this group of workers belongs to the informal economy, in which work-related exposure is unregulated and working conditions are substandard. They use a variety of hair products that contain chemicals that can make them vulnerable to respiratory diseases.42

In Ethiopia, workers in small and medium enterprises, which include beauty salons, are neglected in health and safety programmes, even though working conditions and safety precautions are in their infancy. Investigation of the extent and causes of the disease plays a critical role in determining effective prevention and control strategies. Therefore, this study was conducted to determine the prevalence and associated factors of occupational respiratory morbidity among hairdressers. Accordingly, the prevalence of self-reported respiratory morbidity among Gondar city hairdressers during the past 12 months was 33.3% (95% CI 28.7% to 38.1%). Conversely, the study found that longer working experience, having a higher BMI and working in a beauty salon located near a road...
were significant risk factors for the manifestation of respiratory morbidity among hairdressers.

The overall prevalence of occupational respiratory morbidity in this study was higher than in a couple of studies conducted in India (12.7%) and (19%). However, lower than the studies reported in Palembang, Indonesia (40%) and Jeddah, Saudi Arabia (57%). The discrepancies are likely related to differences in the study period, sampling methods, the measurement tool used (testing vs self-report), the work environment and the extent of exposure to potentially hazardous chemicals in the workplace, especially in hair styling and care techniques such as colouring, bleaching, curling, cutting and other methods. These substances may have irritant and sensitising effects on the airways. The observed differences could also be due to differences in the availability and usage of PPE, the accessibility of occupational health and safety training, regular surveillance and inspection systems and the culture of reporting workplace illnesses across countries. Differences in socioeconomic status may also explain differences in respiratory disease prevalence between countries.

The number of female respondents with respiratory morbidity was 75 (18.6%), whereas the number of male respondents with respiratory morbidity was 59 (14.7%). As indicated in the result section, the p value is 0.077, which means that there is no significant relationship between sex and respiratory morbidity. It is noteworthy that the majority of individuals who engage in hairdressing activities are women, and this study confirmed that the majority of hairdressers were women (62.0%). This high prevalence of respiratory diseases in women can be explained by the fact that, in addition to their hairdressing occupations, women also cook at home, which is associated with the risk of air pollution from cooking fuels. This further increases their exposure to hazardous substances and their likelihood of developing respiratory morbidity and lung abnormalities.

The likelihood of suffering from occupational respiratory morbidity was increased by threefold among hairdressers who had between 3 and 5 years of work experience as compared with those who had 2 or fewer years of work experience, while hairdressers who had more than 5 years of work experience were 6.22 times more likely to develop respiratory morbidity than those who had 2 or fewer years of work experience. This is almost in agreement with a study done in Minnesota, USA, and Palestine, in which more working years are identified as an associated factor with respiratory problems. A similar finding is also reported among paper factory workers in Ethiopia which indicated that workers with work experience of 5 years and above had an increased occurrence of respiratory morbidity. This might be because, with an increasing number of years spent in the occupation, there is also an increased time of exposure to hazardous substances found in hairdressing salons, which leads to the development of respiratory symptoms, as supported by evidence that outlines the beauty salon chemicals are capable of producing respiratory morbidity. This finding supports the evidence that the greater the number of years on the job, the more likely the workers are to suffer.

The incidence of respiratory morbidity was also significantly influenced by BMI in overweight individuals. Hairdressers with an overweight BMI were 3.01 times...
more likely to develop respiratory morbidity than hairdressers with a normal BMI. This study is consistent with studies conducted in Norway and Egypt and reported as suggesting that a higher BMI may increase the risk of worsening respiratory morbidity. The plausible explanation might be that being overweight/obese hinders diaphragmatic movement, diminishes basal lung expansion during inspiration and, with the closure of peripheral lung units, causes ventilation-perfusion abnormalities and arterial hypoxaemia. Consequently, the aforementioned changes contribute to an increase in work of breathing and airway resistance, and these may additionally explain the reason for the higher probability of developing respiratory symptoms among overweight hairdressers than those with a normal BMI. Furthermore, other studies have also demonstrated that reduction in forced vital capacity and expiratory reserve volume due to loss of basal lung volume can occur in overweight individuals.

Moreover, the analysis of the current study indicated that hairdressers who worked in beauty salons near the asphalt road compared with those who worked in beauty salons far from the asphalt road had a 2.15 higher risk of having occupational respiratory morbidity. This finding is similar to that of a study in the USA. On top of that, the study done by Venn et al. reported that living and

### Table 4 Logistic regression analysis of factors associated with occupational respiratory morbidity among hairdressers in Northwestern Ethiopia, 2022 (N=403)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Respiratory morbidity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>COR with 95% CI</td>
<td>AOR with 95% CI</td>
</tr>
<tr>
<td>Types of hair salon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barbershop</td>
<td>74 (55.2)</td>
<td>165 (61.3)</td>
<td>0.77 (0.51 to 1.18)</td>
<td>1.34 (0.54 to 3.32)</td>
</tr>
<tr>
<td>Female hair salon</td>
<td>60 (44.8)</td>
<td>104 (38.7)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>75 (56.0)</td>
<td>175 (65.1)</td>
<td>0.68 (0.45 to 1.04)</td>
<td>0.56 (0.23 to 1.39)</td>
</tr>
<tr>
<td>Male</td>
<td>59 (44.0)</td>
<td>94 (34.9)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>65 (48.5)</td>
<td>157 (58.4)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Married</td>
<td>69 (51.5)</td>
<td>112 (41.6)</td>
<td>1.49 (0.98 to 2.26)</td>
<td>0.89 (0.54 to 1.49)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–29 years</td>
<td>85 (63.4)</td>
<td>205 (76.2)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>30–39 years</td>
<td>45 (33.6)</td>
<td>54 (20.1)</td>
<td>2.01 (1.25 to 3.21)</td>
<td>1.02 (0.56 to 1.85)</td>
</tr>
<tr>
<td>≥40 years</td>
<td>4 (3.0)</td>
<td>10 (3.7)</td>
<td>0.96 (0.29 to 3.16)</td>
<td>0.61 (0.15 to 2.41)</td>
</tr>
<tr>
<td>Work experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2 years</td>
<td>30 (22.4)</td>
<td>133 (49.5)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3–5 years</td>
<td>72 (53.7)</td>
<td>112 (41.6)</td>
<td>2.85 (1.73 to 4.67)</td>
<td>3.05 (1.76 to 5.30)</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>32 (23.9)</td>
<td>24 (8.9)</td>
<td>5.91 (3.05 to 11.44)</td>
<td>6.22 (2.73 to 14.16)</td>
</tr>
<tr>
<td>Passive smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30 (22.4)</td>
<td>44 (16.4)</td>
<td>1.47 (0.88 to 2.47)</td>
<td>1.35 (0.74 to 2.48)</td>
</tr>
<tr>
<td>No</td>
<td>104 (77.6)</td>
<td>225 (83.6)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Body mass index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>111 (82.8)</td>
<td>239 (88.9)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Underweight</td>
<td>8 (6.0)</td>
<td>20 (7.4)</td>
<td>0.86 (0.37 to 2.02)</td>
<td>1.35 (0.52 to 3.39)</td>
</tr>
<tr>
<td>Overweight</td>
<td>15 (11.2)</td>
<td>10 (3.7)</td>
<td>3.23 (1.41 to 7.42)</td>
<td>3.01 (1.19 to 7.58)</td>
</tr>
<tr>
<td>Location of the beauty salon from the road</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near road</td>
<td>86 (64.2)</td>
<td>121 (45.0)</td>
<td>2.19 (1.43 to 3.36)</td>
<td>2.15 (1.33 to 3.47)</td>
</tr>
<tr>
<td>Far from road</td>
<td>48 (35.8)</td>
<td>148 (55.0)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Values of variables that were significantly associated with respiratory morbidity in the multivariable logistic regression analysis are highlighted in bold.

*Significant at p value<0.05, **Significant at p value<0.001 in multivariable logistic regression analysis, Hosmer-Lemeshow test p value=0.375.

*1: reference category; AOR, adjusted OR; COR, crudes OR.
working near a road is associated with an increased risk of wheezing, one of the respiratory symptoms. A possible justification for this finding could be because the levels of vehicle emissions like nitrogen oxides, dust and other particles are greatest near roadways. This makes for higher exposure and a higher risk of occupational respiratory morbidity among hairdressers working near the roadside. Moreover, during the data collection period of our study, most of the roads in Gondar city were poorly maintained and also were on upgrading construction. As a result, these conditions on roads could lead to high road dust generation during vehicle transportation and windy season, which inevitably increases the risk of occupational respiratory morbidity among road adjacent dwellers and workers.

This study is the first of its kind to investigate the prevalence and factors associated with occupational respiratory morbidity among hairdressers in Ethiopia, where occupational exposures are unregulated and working conditions are substandard. Even though these workers are highly affected by respiratory problems, there is little or no local data in the country on the respiratory needs of hairdressers. Study limitations include the use of self-reported health data as regards the history of respiratory symptoms, which may have introduced recall bias. In addition, due to feasibility issues, lung function tests and environmental air sampling for the pollutants were not performed. Furthermore, this study could not show a temporal relationship due to the nature of the cross-sectional study design used.

CONCLUSION

This study concluded that one-third of hairdressers experienced occupational respiratory morbidity, which indicates a significant public health issue that requires immediate attention. Longer work experience, a higher BMI, and working near roadsides were found to be significant risk factors for the occurrence of respiratory morbidity in hairdressers. Urgent action is therefore needed to develop and implement multidisciplinary interventions aimed at modifying the work environment based on work experience and improving behavioural characteristics, such as dietary calorie restriction in overweight individuals to reduce respiratory morbidity. Besides, the development and implementation of air pollution mitigation measures targeted at roadside workers are advised to curb the problem

Acknowledgements. We would like to thank the University of Gondar for providing ethical clearance. The authors are also very much grateful to all the data collectors, the supervisor and the study participants.

Contributors. AHF: Initiated the research concept, wrote up the research proposal, analysed the data, presented the results and discussions, wrote up the draft manuscript, reviewed and finalised the manuscript document, is the guarantor and is the corresponding author. GTE: Participated in the presentation and interpretation of results and discussions, and reviewed the draft manuscript document. BD: Participated in the presentation and interpretation of results and discussions, and reviewed the draft manuscript document. GA: Initiated the research concept, wrote up the research proposal, analysed the data, presented the results and discussions, wrote up the draft manuscript, reviewed and finalised the manuscript document.

Funding. The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests. None declared.

Patient and public involvement. Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication. Consent obtained directly from patient(s).

Ethics approval. This study involves human participants and was approved by The University of Gondar Institutional Ethical Review Board (IRB number-EH0S-809-2022). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review. Not commissioned; externally peer reviewed.

Data availability statement. Data are available upon reasonable request. All the data generated in this study are included in this manuscript. The data sets used and analysed to produce the current manuscript can be obtained from the corresponding author upon reasonable request via the email address at amenisieahailu@gmail.com.

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REFERENCES

6 Chen MA. The informal economy: definitions, theories and policies. 2005.
Open access


42 Secretariat AC. Cosmetology and wellness: a review of practices, products, risks, and the standardization needs for Africa Nairobi, kenya. 2015.


50 Jumbo J. Respiratory symptoms amongst hairdressers: a review. 10. 2020.


