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Indoor Air Pollution and Respiratory Health of Women in a Rural Community of Nepal

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Introduction

- In Nepal, the second highest ranking risk factor for death and disability is household indoor air pollution (IAP) (Institute for Health Metrics and Evaluation, 2020)
- Women, as a main cook in the household, spend an immoderate amount of time in the kitchen which results in high exposure of IAP (Pant et al., 2016)
- Less is known that which kitchen characteristics contribute to IAP and deteriorate respiratory health of women
- Investigate the association between respiratory symptoms among women and kitchen characteristics including a type of cook stove and ventilation



Figure 1: a woman (main cook) with a traditional cookstove, boiling water



Figure 2: a type of traditional cookstove (three-stone cooking fire)

Method

- Location: Manekharka of Sindhupalchowk district, Nepal; a land of many stupas and greenery; 65km from the capital Kathmandu; seven hours by bus on a treacherous, unpaved road
- Data collection: a community-based cross-sectional survey, randomly selected neighborhoods by visiting homes door-to-door
- Data collection duration: December 2019 ~ January 2020Data collector: researchers from the JW LEE Center for Global Medicine, Seoul National University, and enumerators of the Community Department of Dhulikhel hospital
- Study population: A total of 329 women
- Survey questionnaire: the main cook's fuel use, cooking device, kitchen structure, and respiratory health symptoms (such as throat, cough, phlegm, wheeze, chest pain, shortness of breath, burn, eye irritation, headaches), CAT (Chronic obstructive pulmonary disease Assessment Tool)
- Statistical analysis: descriptive analysis and multivariate regression analysis to examine associations between respiratory symptoms and the kitchen characteristics contributing to IAP

Table 1. Socioeconomics characteristics, health outcomes, and kitchen characteristics among rural Nepali women in charge of household cooking

Health Outcomes		
Chronic respiratory symptoms		
	Mean (±SD)	
CAT	10.3±8.5	
	Group	n (%)
Shortness of breath	Yes	117(35.6)
	No	212(64.4)
Morning phlegm	Yes	133(41.3)
	Not	189(58.7)
Nose and throat irritation	Yes	137(42.4)
	No	186(57.6)
Cough 4~6 times a day	Yes	106(32.9)
	No	216(67.1)
Wheeze	Yes	72(21.5)
	No	263(78.5)
Other symptoms		
	Group	n (%)
Headache	Yes	223(69.0)
	No	100(31.0)
Burns	Yes	42(12.6)
	No	292(87.4)
Eye irritation	Yes	123(38.1)
	No	200(61.9)
Back pain	Yes	178(55.8)
	No	141(44.2)
Socio-demographic Characteristics		
	Group	n (%)
Age (yrs)	≤ 35 yrs	95(29.4)
	36yrs ≤ ≤ 50yrs	119(36.8)
	51yrs ≤	109(33.75)
Ethnicity	Brahman/ Chhetri	64(19.8)
	Dalit	24(7.4)
	Janajati	235(72.8)
Education level	None	244(75.5)
	> Primary	79(24.5)
Smoking	Yes	106(32.8)
	No	217(67.2)
Income (US $)	> 390	13(4.0)
	195 – 390	51(15.8)
	146 – 195	36(11.1)
	98 – 146	60(18.6)
	58 – 98	163(50.5)
Agricultural worker	Yes	200(60.8)
	No	129(39.2)
Home Environment		
	Group	n (%)
Kitchen type	Single structure	94(29.1)
	Divided structure	229(70.9)
Window ventilation	Yes	252(78.0)
	No	71(22.0)
Main Cooking Device	LPG stove	93(28.8)
	Traditional Cooking Device	229(71.1)

Results

Descriptive analysis

- Currently using a traditional cooking stove: 229 (71.1%)
- Wood for their primary cooking fuel: 315 (95.7%)
- Single structure kitchen: 28.3%
- No window ventilation system in their home: 22.0%

Multivariate regression analysis

- A traditional cooking stove as the primary cooking stove was significantly associated with a CAT(β=0.39, 95% CI: 0.16, 0.63) and wheeze (odds ratio (OR): 2.57, 95% CI: 1.19, 5.59)
- Agriculture workers were significantly associated with CAT outcome (β=0.37(0.16, 0.59), compared to ref cat; wheeze (OR: 2.62, 95% CI: 1.46, 4.69); nose and throat irritation (OR: 4.38, 95% CI: 2.57, 7.47); phlegm in the morning (OR: 4.28, 95% CI: 2.45, 7.47); shortness of breath (OR: 3.01, 95% CI: 1.73, 5.23)

Conclusion

- The traditional cooking stove, the primary cooking device of Nepali women negatively associated with better respiratory health symptoms in Nepal's rural community
- Women working in agriculture had more respiratory health risks than ref CAT
- Ensuring the adoption of optimal and appropriate technologies such as improved cooking stove may be needed to prevent worsening respiratory health symptoms of women in Nepal, further related death and disability

Table 2 Multivariate regression analysis showing associations between respiratory health outcomes and household environment

VARIABLES	CAT Rate ratio (95% CI)	Wheeze OR (95% CI)	Cough 3-4 times a day OR (95% CI)	Nose and throat irritation OR (95% CI)	Phlegm OR (95% CI)	Shortness of breath OR (95% CI)
Age						
0-35 Ref.						
36-50	0.24 (-0.05, 0.52)	0.97 (0.42, 2.23)	1.64 (0.73, 3.70)	1.10 (0.55, 2.19)	1.53 (0.75, 3.15)	1.00 (0.49, 2.07)
51+	0.39** (0.09, 0.70)	1.36 (0.57, 3.23)	2.45** (1.06, 5.70)	1.52 (0.73, 3.20)	3.28*** (1.51, 7.12)	2.10* (0.98, 4.51)
Ethnicity						
Brahman/ Chhetri Ref.						
Dalit	-0.01 (-0.41, 0.39)	1.61 (0.55, 4.69)	2.31 (0.77, 6.96)	1.00 (0.36, 2.76)	1.41 (0.49, 4.00)	0.85 (0.31, 2.35)
Janajati	-0.17 (-0.42, 0.09)	0.64 (0.31, 1.33)	0.91 (0.46, 1.81)	0.66 (0.35, 1.24)	1.12 (0.58, 2.13)	0.47** (0.25, 0.90)
Education						
None Ref.						
> Primary	-0.23 (-0.51, 0.06)	0.51 (0.20, 1.26)	0.93 (0.41, 2.10)	1.12 (0.55, 2.26)	1.23 (0.59, 2.57)	0.74 (0.35, 1.57)
Smoking						
Non-smoker Ref.						
Smoker	0.13 (-0.09, 0.35)	1.19 (0.64, 2.21)	4.29*** (2.43, 7.59)	1.11 (0.64, 1.92)	1.74** (1.00, 3.02)	0.82 (0.47, 1.44)
Income						
> 390 Ref.						
195 – 390	-0.16 (-0.75, 0.42)	5.91 (0.63, 55.36)	2.44 (0.42, 14.05)	1.66 (0.43, 6.44)	2.54 (0.57, 11.34)	1.25 (0.30, 5.16)
146 – 195	0.05 (-0.56, 0.66)	4.42 (0.44, 44.95)	2.28 (0.37, 14.14)	1.02 (0.25, 4.21)	1.28 (0.26, 6.35)	0.65 (0.14, 3.05)
98 – 146	-0.18 (-0.77, 0.40)	2.11 (0.22, 20.01)	2.89 (0.52, 16.11)	0.86 (0.22, 3.33)	1.58 (0.35, 7.04)	0.74 (0.18, 3.09)
58 – 98	-0.21 (-0.77, 0.35)	3.43 (0.39, 30.10)	2.70 (0.52, 13.96)	1.01 (0.28, 3.62)	2.27 (0.55, 9.45)	1.49 (0.39, 5.66)
Agriculture as an Occupation						
No Ref.						
Yes	0.37*** (0.16, 0.59)	3.01*** (1.56, 5.79)	2.62*** (1.46, 4.69)	4.38*** (2.57, 7.47)	4.28*** (2.45, 7.47)	3.01*** (1.73, 5.23)
Kitchen Type						
A Single Structure Ref.						
Divided Structure	-0.12 (-0.35, 0.11)	1.74 (0.90, 3.36)	1.21 (0.66, 2.23)	1.05 (0.60, 1.84)	1.16 (0.65, 2.04)	1.04 (0.58, 1.85)
Home ventilation						
No Ref.						
Yes	0.09 (-0.15, 0.33)	0.84 (0.43, 1.66)	0.67 (0.35, 1.26)	0.67 (0.37, 1.20)	0.81 (0.44, 1.49)	0.77 (0.43, 1.40)
Main Cooking Device						
LPG Ref.						
Traditional Stove	0.39*** (0.16, 0.63)	2.57** (1.19, 5.59)	1.35 (0.70, 2.59)	1.61 (0.90, 2.88)	1.17 (0.65, 2.11)	1.65 (0.90, 3.05)
Observations	274	319	322	323	322	323
R-squared	0.17					