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# 1 Familial and socio-cultural barriers in maintaining Tobacco Free Homes in 2 Bangladesh: a comparative cross-sectional study

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22 **ABSTRACT**

23 **Objectives:** Children, pregnant women and the elderly at a global level are all being  
24 dangerously exposed to tobacco use in the household (HH). However, there is no understanding  
25 of the familial and socio-cultural factors that provide barriers to ensuring tobacco-free homes  
26 in Bangladesh either in urban or rural areas (U&RAs). This study therefore investigates those  
27 barriers to help enable a move towards tobacco free homes in Bangladesh.

28 **Design:** Comparative cross-sectional study.

29 **Settings:** Data were collected from both urban and rural settings in Bangladesh.

30 **Participants:** A probability proportional sampling procedure was used to select 808  
31 participants in U&RAs out of a total of 3,715 tobacco users.

32 **Results:** The prevalence of tobacco use at home was 25.7% in urban areas and 47.6% in rural  
33 areas. In urban areas: marital status ( $AOR=3.23$ ,  $95\%CI=1.37-6.61$ ), education ( $AOR=2.14$ ,  
34  $95\%CI=1.15-3.99$ ), the smoking habits of elderly family members ( $AOR=1.81$ ,  $95\%CI=0.91-$   
35  $2.89$ ), offering tobacco as a traditional form of leisure activity at home ( $AOR=1.85$ ,  
36  $95\%CI=.94-2.95$ ), and lack of religious practices ( $AOR=2.39$ ,  $95\%CI=1.27-4.54$ ) were  
37 identified as significant socio-cultural predictors associated with tobacco use at home. In rural  
38 areas: age ( $AOR=5.11$ ,  $95\%CI=2.03-12.83$ ), extended family ( $AOR=3.08$ ,  $95\%CI=1.28-7.38$ ),  
39 lack of religious practices ( $AOR=4.23$ ,  $95\%CI=2.32-7.72$ ), using children to buy or carry  
40 tobacco ( $AOR=3.33$ ,  $95\%CI=1.11-9.99$ ), lack of family guidance ( $AOR=4.27$ ,  $95\%CI=2.45-$   
41  $7.42$ ), and offering tobacco as a traditional form of leisure activity at home ( $AOR=3.81$ ,  
42  $95\%CI=2.23-6.47$ ) were identified as significant determinants for tobacco use at home.

43 **Conclusion:** This study concludes that socio-cultural traditions and familial norms in  
44 Bangladesh provide significant barriers for enabling tobacco-free homes. The identification of  
45 these barriers can aid policy makers and programme planners in Bangladesh in devising

46 appropriate measures to mitigate the deadly consequences of tobacco use in the home. The  
47 consequences also include the dangers involved in family members being exposed to second-  
48 hand smoke.

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51

52 **Strengths and limitations of the study**

- 53       • This study is the first to comparatively explore the barriers present in rural and urban  
54       areas of Bangladesh for encouraging tobacco free homes.
- 55       • It provides crucial evidence for policy makers in developing appropriate policies and  
56       laws to declare homes as tobacco-free zones and to initiate anti-tobacco measures to  
57       ensure compliance.
- 58       • A multi-stage randomized sampling from both U&RAs was used in this study that  
59       means the findings could be applicable to other parts of Bangladesh.
- 60       • A limitation of this study occurred during data collection when up to a third of  
61       participants were unavailable due to being out at work, for example, in which case the  
62       next participant in the sampling frame was chosen. This could potentially cause  
63       selection bias. Also, due to the cross-sectional design, this study identified adjusted  
64       associations rather than causality.

65

66 **Key Words**

67 Socio-cultural barriers, Tobacco use, Second-hand smoking, Tobacco free homes,  
68 Bangladesh.

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71

## 72 INTRODUCTION

73 Tobacco use and its effects kills more than 8.2 million people worldwide each year. Within this  
74 total, 7 million deaths are caused by direct tobacco use, while 1.2 million are due to non-  
75 smokers being exposed to second-hand smoke (SHS) [1]. Despite various global and national  
76 efforts aimed at reducing the extent of tobacco use, the prevalence rates are still high in many  
77 parts of the developing world [2]. Historically, there is a significant relationship between  
78 familial and socio-cultural traditions around tobacco use particularly in Asian and African  
79 countries where tobacco is an entrenched part of leisure and hospitality activities [3].  
80 Nevertheless, socio-cultural practices around the use of tobacco differ in relation to gender,  
81 religion, ethnicity, and local beliefs across those countries and there are in-country variations  
82 between rural and urban areas [3]. These socio-cultural practices provide significant barriers  
83 for enabling tobacco free homes.

84

85 Bangladesh is among the top ten tobacco producing and consuming countries in the world, and  
86 is facing deadly health and economic consequences [4]. Around 35.3% of Bangladeshi adults  
87 use tobacco whether for smoking or in smokeless form and 39.0% are exposed to tobacco  
88 smoke in their homes [5]. The prevalence of smoking is higher in urban areas and with  
89 increased urbanisation, this could become a rising trend [6]. The evidence shows that urban  
90 dwellers are more aware than those in rural areas about the health consequences of tobacco use  
91 but often do not take the threats seriously and continue using it at home [6]. Social custom and  
92 perception can often influence the smoking behavior of urban people. For example, when  
93 gathering together, they can often overestimate the extent of smoking within their own age  
94 group and adopt the fallacy that smoking will make them look smarter [7, 8]. However, when  
95 taking smokeless tobacco (SLT) into account, the overall prevalence of tobacco use is greater  
96 among rural residents than it is among their urban counterparts. Although the use of SLT is

97 common among adults in rural areas, there is a general lack of awareness about its harmful  
98 effects [9]. Previous studies have highlighted the differences in knowledge and attitudes  
99 between people in U&RAs towards the harmful effects of tobacco use [10]. In spite of the  
100 detrimental effects of SLT [11], people in rural areas do not generally believe that the  
101 commonly used *Zarda*, *Gul*, *SadaPata*, and other forms of smokeless products are actually  
102 made from tobacco. The use of SLT at the household level is perceived as a socio-cultural  
103 tradition that is widely accepted and will be served to guests as part of cultural celebrations  
104 [12]. The use of tobacco (both smoking and SLT) is common in Bangladesh after having food,  
105 tea and snacks both in small and large social gatherings [13, 14, 15]. It has been established,  
106 however, that such traditions are harmful and detrimental to health and wellbeing [13, 14, 15,  
107 16].

108

109 Exposure to second hand smoke (SHS) is another hidden problem and studies suggest that it is  
110 associated with serious health issues among children and adults. Life-time risks of exposure to  
111 SHS among non-smokers, for example, are 20-30% more in the case of coronary heart disease  
112 and lung cancer and more than 600,000 deaths worldwide have been attributed to SHS exposure  
113 [1]. The WHO's Framework Convention on Tobacco Control (WHO-FCTC) concluded that  
114 having 100% smoke-free environments is the only way to adequately protect people from the  
115 harmful effects of SHS because there is no acceptable level of exposure [17]. In this regard,  
116 smoke-free laws have been positively associated with people quitting the habit and in  
117 preventing young people from being tempted to start smoking in the first place [18, 19]. A  
118 recent study of four European countries (Germany, Netherlands, Ireland and France) that have  
119 smoke-free legislation, revealed that banning it did not encourage more smoking at home but  
120 rather prompted total smoking bans to be followed at home compared to the impact in the UK  
121 that was used as the control country [20]. In Bangladesh, smoking in healthcare settings and

122 educational institutions are prohibited by law and this has been well-enforced so far, and there  
123 is also a partial smoking ban in public places [21]. However, the existing tobacco control  
124 policies in the country are yet to make second-hand smoking at the household level a priority  
125 [21].

126

127 As far as can be discerned from the literature, the majority of studies conducted in Bangladesh  
128 focused solely on the prevalence, burden and other general issues around tobacco use and  
129 concentrated either on urban areas or rural areas but, to-date, there has been no comparative  
130 study between the two areas. Previous studies have rarely explored the socio-cultural traditions  
131 around tobacco use and how they operate as barriers for establishing tobacco free households  
132 [6, 7, 11, 12, 14, 15]. This study fills a gap in knowledge by focusing on the prevailing familial  
133 and socio-cultural barriers for creating tobacco free homes in Bangladesh.

134

135

136

## 137 **METHODS**

### 138 *Study design and settings*

139 A comparative cross-sectional survey was conducted in both the U&RAs of Bangladesh using  
140 multi-stage random sampling. This approach provided comparative information on familial and  
141 socio-cultural barriers and helped in triangulating and observing real scenarios about obstacles  
142 between the urban and rural contexts. Dhaka is a mega-crowded city and was selected as the  
143 urban area for this study as it could provide useful scenarios for understanding all urban areas  
144 in Bangladesh. There are two city corporations in Dhaka namely, the North City Corporation  
145 and the South City Corporation. Two areas from each of the administrative parts were randomly  
146 selected and included Mohammadpur and Uttara Sector-6 from the North City Corporation,  
147 with Dhanmondi, and Motijheel selected from the South City Corporation.. In rural areas, four  
148 districts namely, Narayanganj, Comilla, Natore, and Narshingdi were randomly selected from  
149 the 64 districts of Bangladesh and a village was then randomly selected from each of these four  
150 districts (Figure 1) for data collection.

151 **(Place Figure 1 here)**

152

### 153 *Study participants and sampling*

154 The sample size was calculated using the following formula:

155 
$$n = \frac{z^2 p(1 - p)}{d^2} [\times (\text{design effect})]$$

156 Where n = desired sample size; z = 1.96 at 95% Confidence Interval (CI); p = prevalence of  
157 overall current tobacco use = 35.3% [GATS 2017]; d = precision level (5%), and design effect  
158 is considered as 2. The calculated sample size is  $n = 349.33 \times 2 = 699$ . A 15% non-response of

159 699 was anticipated, and therefore 808 participants were selected from the urban and rural  
160 areas.

161

162 Prior to collecting the data, a list of 6,065 households was gathered from the city corporation  
163 offices (urban) and from the Union Parishad (the lowest rural administrative unit) involving a  
164 total population of 24,078. After a short enumeration survey, a total of 3,715 tobacco users  
165 were identified (urban - 1436 and rural - 2279) and used as the sampling frame and by the  
166 means of a probability proportional sampling procedure, 808 participants were identified  
167 (urban n = 400; and rural n = 408) for data collection. One participant from every third tobacco  
168 user in urban areas and one in every fifth tobacco user in rural areas were identified. Inclusion  
169 criteria for participants in the survey included: i) any kind of tobacco use (smoking or SLT);  
170 ii) only one participant from each household; iii) aged 18 years and above; iv) physically  
171 capable; v) males and females and vi) willing to participate in the survey. Participants were  
172 diverse in terms of ethnicity, religion, education and economic status. Around one-third of  
173 participants in urban areas and one-fourth of participants in rural areas in the sampling frame  
174 were unavailable during the data collection period, so the next participant in the frame was  
175 selected who fulfilled the inclusion criteria (Figure 1).

176

### 177 *Development of tools, data collection and analysis*

178 A multidisciplinary team contributed to the development of the data collection tools. The PI  
179 had a pivotal role in drafting the semi-structured interview questionnaire that was then checked  
180 and finalized by the technical expert team. The Bangla version of the questionnaire was pre-  
181 tested among 40 eligible people (urban - 20; rural - 20) in non-sample sites and amended  
182 according to the feedback. The investigators and interviewers were trained, and the field data  
183 were collected under the strict supervision of the PI and technical team. The data collected were

184 quickly checked for completeness and errors before being coded and entered into a database  
185 using SPSS software. A Chi-Square ( $\chi^2$ ) and bivariate logistic regression were used to explore  
186 the factors associated with tobacco use at home. Multivariate logistic regression was used to  
187 adjust the effect of confounders on the association of risk factors - a response of “Yes or No”  
188 to the question of ‘tobacco use at home’ was a dependent variable, where “No” was used as  
189 reference. Socio-cultural and familial factors were used as independent variables, and the  
190 findings were interpreted using odds ratio with 95% CI for each category.

191

### 192 ***Patient and Public Involvement:***

193 The participants of the study were adult tobacco users selected from the study population. They  
194 were not involved in setting the research question or the outcome measures, but they were  
195 involved during the data collection of the study. The tobacco users from the selected  
196 households were interviewed and were involved in the dissemination of the results.

197

### 198 ***Ethical considerations***

199 As the research involved participation of human subjects for interviews, ethical clearance was  
200 sought from the National Research Ethics Committee (NREC), the highest ethics body in  
201 Bangladesh. The protocol for the study was also reviewed and approved by the Bangladesh  
202 Medical Research Council (BMRC) and provided with an ethics ID number of  
203 BMRC/NREC/2016-2019/1429. When first meeting participants, the interviewers explained  
204 the background and objectives of the study and obtained written informed consent from each  
205 of them. Anonymity and confidentiality were strictly maintained.

206

207 **RESULTS**

208 *Socio-demographic characteristics of the participants*

209 The mean ages ( $\pm$  SD) of participants were  $30.4 \pm 10.4$  and  $27.58 \pm 6.7$  years in U&RAs  
 210 respectively. Age and sex were found to be significantly associated ( $p < 0.001$ ) with place of  
 211 tobacco use in urban areas. The majority of female tobacco users did so at home both in urban  
 212 (84.6 %) and rural (49.1%) settings. In urban areas, there was a highly significant association  
 213 ( $p < 0.001$ ) between marital status and place of tobacco use, with more married participants  
 214 (25.4%) found to use tobacco products at home. Additionally, the living status of participants  
 215 was found to be significantly associated ( $p < 0.001$ ) with place of tobacco use in rural areas and  
 216 a higher proportion of them (55.9%) living alone/outside of their own family were using  
 217 tobacco at home. More participants at lower-and-middle socioeconomic levels and living in  
 218 rural areas were using tobacco at home, and this association was found to be significant  
 219 ( $p < 0.01$ ) (Table 1).

220

221 **Table 1: Socio-demographic characteristics of the participants**

222

Demographic characteristics	Urban n=400			Rural n=408		
	Place of Tobacco use by participants		$\chi^2$	Place of Tobacco use by participants		$\chi^2$
	At home n (%)	Outside home n (%)		At home n (%)	Outside home n (%)	
<b>Age</b>						
$\leq 30$ Years	28 (10.7)	234 (89.3)	25.94***	51 (26.3)	143 (73.7)	4.440
$>30$ Years	43 (31.2)	95 (68.8)		77 (36.0)	137 (64.0)	
Mean $\pm$ SD	30.4 $\pm$ 10.4			27.58 $\pm$ 6.7		
<b>Sex</b>						
Male	60 (15.5)	327 (84.5)	41.14*** †	76 (25.2)	226 (74.8)	20.801***†
Female	11 (84.6)	2 (15.4)		52 (49.1)	54 (50.9)	
<b>Marital status</b>						
Unmarried	17 (9.1)	170 (90.9)	18.03***	33 (28.2)	84 (71.8)	0.764
Married	54 (25.4)	159 (74.6)		95 (32.6)	196 (67.4)	
<b>Living place</b>						

With family	54 (18.2)	243 (81.8)	0.15	76 (24.1)	239 (75.9)	33.696***
Alone/Outside of own family	17 (16.5)	86 (8.5)		52 (55.9)	41 (44.1)	
<b>Family type</b>						
Nuclear Family	42 (14.3)	251 (85.7)	8.75***	38 (40.4)	56 (59.6)	4.649
Extended Family	29 (27.1)	78 (72.9)		90 (28.7)	224 (71.3)	
<b>Education</b>						
Primary- Secondary	29 (23.8)	93 (76.2)	11.86***	67 (26.2)	189 (73.8)	8.632
Higher education	42 (15.1)	236 (84.9)		61 (40.1)	91 (59.9)	
<b>Socio-economic condition</b>						
Low and middle income	21 (19.3)	88 (80.7)	0.24	99 (41.4)	140 (58.6)	27.068**
Upper and high income	50 (17.2)	241 (82.8)		128 (31.4)	280 (68.6)	

223 Note: †Fisher's exact test was used as some of the expected cell value (for sex) found <5.

224 \*\*p<0.01; \*\*\*p<0.001

225

## 226 *Prevalence of tobacco use at household level*

227 The prevalence of tobacco use at home was calculated by dividing the total number of people  
228 (either participant or any other family member) that used tobacco products inside their homes  
229 within all the sample households. The prevalence of tobacco use overall (smoking or SLT) at  
230 home was calculated to be 25.7% in urban areas (participants: 17.7%; other family members:  
231 8.0%) and 47.6% in rural areas (participants: 19.4%; other family members: 28.2%). See Figure  
232 2 below.

233

234 **(Place Figure 2 here)**

235

## 236 *Risk factors for tobacco use at home*

237 Bivariate analysis showed that age, religious practice, children being used to carry and buy  
238 tobacco and offering tobacco as a tradition of leisure and entertainment activities at the  
239 household level, were all associated with tobacco use at home both in urban and rural areas. In  
240 addition, marital status, lower education levels and the smoking habits of elderly family

241 members were significantly associated with tobacco use at home in urban areas. Living status,  
 242 family type, and lack of family guidance (on the overall consequences of tobacco use) were  
 243 found to be significant with tobacco use at home in rural areas (Table 2).

244

245 **Tale 2. Adjusted risk factors associated with place of tobacco use in U&RAs of**  
 246 **Bangladesh**  
 247

Characteristics/ Risk factors		Urban areas		Rural areas	
		Bivariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)	Bivariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)
Age	≤30 Years <sup>RC</sup>	1	1	1	1
	>30 Years	3.78*** (2.22-6.44)	3.13** (1.45-6.78)	4.79*** (2.76-8.31)	5.11*** (2.03-12.83)
Marital Status	Unmarried <sup>RC</sup>	1	1	1	1
	Married	3.39*** (1.89-6.10)	3.23*** (1.37-6.61)	0.81 (0.51-1.29)	0.76 (0.46-1.26)
Socio-economic condition	Low and middle income <sup>RC</sup>	1	1	1	1
	Upper and high income	1.15 (0.65-2.02)	0.66 (0.33-.1.30)	0.51** (0.31-0.84)	0.41** (0.23-0.72)
Living status	Living with family <sup>RC</sup>	1	1	1	1
	Living alone/others	1.12 (0.62-2.04)	0.69 (0.35-1.37)	5.07*** (2.92-8.80)	7.93*** (3.01-20.89)
Education	Higher education <sup>RC</sup>	1	1	1	1
	Primary-Secondary	2.46*** (1.46-4.16)	2.14** (1.15-3.99)	0.52** (0.34-0.81)	1.99 (1.24-3.21)
Family type	Nuclear family <sup>RC</sup>	1	1	1	1
	Extended family	0.45*** (0.26-0.77)	0.49* (0.28-0.85)	4.39*** (2.52-7.61)	3.08** (1.28-7.38)
Occupation	Non-working <sup>RC</sup>	1	1	1	1
	Working	0.40** (0.21-0.75)	0.96 (0.44-2.12)	0.78 (0.50-1.20)	1.48 (0.89-2.45)
Practice of Religiosity	Practice <sup>RC</sup>	1	1	1	1
	Lack of Practice	2.25** (1.20-4.21)	2.39** (1.27-4.54)	5.17*** (2.91-9.19)	4.23** (2.32-7.72)
Smoking habit of any elder family members	No <sup>RC</sup>	1	1	1	1
	Yes	1.97*** (1.28-2.28)	1.81* (0.91-2.89)	1.04 (0.64-1.68)	1.01 (0.58-1.74)
	No <sup>RC</sup>	1	1	1	1

<b>Perception that smoking makes one look smart</b>	Yes	0.79(0.47-1.35)	0.61(0.34-1.07)	0.23*** (0.15-0.37)	0.38*** (0.23-0.63)
<b>Tobacco restriction at home</b>	No <sup>RC</sup>	1	1	1	1
	Yes	0.66 (0.40-1.13)	0.70 (0.40-1.21)	0.16*** (0.10-0.25)	0.15 (0.09-0.24)
<b>Children are used to buy/carry/light tobacco</b>	No <sup>RC</sup>	1	1	1	1
	Yes	2.07** (1.14-3.79)	2.28 (1.21-4.29)	4.58*** (2.64-7.95)	3.33** (1.11-9.99)
<b>Lack of family guidance</b>	No <sup>RC</sup>	1	1	1	1
	Yes	0.89 (0.36-2.21)	0.94 (0.35-2.46)	3.86 (2.34-6.38)	4.27*** (2.45-7.42)
<b>Offering tobacco as a tradition of entertainment</b>	No <sup>RC</sup>	1	1	1	1
	Yes	1.81*** (0.94-3.51)	1.85** (0.94-2.95)	3.48*** (2.14-5.65)	3.81*** (2.23-6.47)
<b>Peer influences (smoking)</b>	No <sup>RC</sup>	1	1	1	1
	Yes	0.49 (0.14-1.67)	0.41 (0.11-1.45)	0.13 (0.8-0.22)	0.20 (0.12-0.36)
<b>Impact of advertisement and publicity</b>	No <sup>RC</sup>	1	1	1	1
	Yes	1.29 (0.77-2.16)	1.31 (0.76-2.26)	0.15*** (0.09-0.24)	0.12*** (0.07-0.21)

248 Note: OR=Odds Ratio; AOR=Adjusted Odds Ratio; <sup>RC</sup> =Reference Category  
249 \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.  
250

251 Multivariable analysis (adjusted) showed that participants aged 30 years and above had  
252 increased odds of using tobacco products at home by more than three times in urban areas  
253 (AOR=3.13, 95%CI=1.45-6.78) and more than five times in rural areas (AOR=5.11,  
254 95%CI=2.03-12.83). This risk among the lower-educated participants was shown to be double  
255 for both urban (AOR=2.14, 95%CI=1.15-3.99) and rural areas (AOR=1.99, 95%CI=1.24-  
256 3.21). In rural areas, participants living alone or outside their own family had approximately  
257 an eight times (AOR=7.93, 95%CI=3.01-20.89) higher chance of adopting tobacco practices  
258 at home, but in urban areas the risk was found to be neutral. Similarly, participants with a lack  
259 of religious practice at the family level were more prone to use tobacco at home in both urban  
260 (AOR=2.39, 95%CI=1.27-4.54) and rural areas (AOR=4.23, 95% CI=2.32-7.72). Where  
261 tobacco was offered as part of the tradition of leisure and entertainment activities, the likelihood

262 of its use was found to be higher both in urban (AOR=1.85, 95%CI=0.94-2.95) and rural areas  
263 (AOR=3.81, 95% CI=2.23-6.47). Furthermore, the odds of tobacco use was also found to be  
264 significantly higher among both urban (AOR 2.28, 95%CI=1.21-4.29) and rural areas  
265 (AOR=3.33, 95%CI=1.11-9.99) where children were used to buy or carry tobacco and to light  
266 cigarettes.

267

268 Other factors such as marital status (married), the smoking habits of older family members  
269 (AOR=3.23, 95%CI=1.37-6.61;AOR=1.81, 95%CI=0.91–2.89 respectively) were  
270 significantly associated with tobacco use at home in urban areas, whereas extended family and  
271 lack of family guidance (AOR=3.08, 95%CI=1.28-7.38;AOR=4.27, 95%CI=2.45-7.42  
272 respectively) were significant barriers for tobacco use at home in rural areas only. However,  
273 multivariate analysis found that socio-economic conditions, occupations, peer influences, the  
274 perception that smoking makes people look smarter, restrictions on tobacco use, the impact of  
275 advertising and publicity were insignificant predictors of tobacco use at home in both urban  
276 and rural areas (Table 2).

277

## 278 **DISCUSSION**

279 Research, policies and interventions carried out in Bangladesh to-date have paid very little  
280 attention to the impact that tobacco free homes [5, 21] could have on the health and wellbeing  
281 of its people. This situation is in spite of recent studies showing that SHS inhalation is around  
282 four times more toxic, and side-stream condensate is two-to-six times more carcinogenic, than  
283 mainstream smoking [22].

284

285 Comparative analysis between the socio-cultural impacts of tobacco use at home in urban and  
286 rural contexts is also quite limited. This study compares tobacco use at home in both urban and

287 rural areas in Bangladesh and shows that more than one-fourth (25.7%) of urban dwellers, and  
288 nearly half (47.6%) of rural dwellers use tobacco at home (either smoking or SLTs). Aligned  
289 with this finding, a rural community-based Bangladeshi study showed that smoking at home  
290 was common practice in more than half (55.0%) of households [23]. A similar trend was also  
291 observed in the neighbouring country of India where 40.0% of adults reported that they smoked  
292 tobacco products at home [24].

293

294 Multivariate analysis found that age was an important factor for using tobacco at home both in  
295 urban and rural areas and is in harmony with the findings of other studies conducted in similar  
296 settings in Bangladesh and in India [10, 25]. Also, adults aged 30 or above were found to be  
297 more likely to use tobacco at home, a practice more prevalent in rural areas than in urban areas.

298

299 The likelihood of using tobacco at home in urban areas among the married participants was  
300 more than three times higher than for their unmarried counterparts. A possible reason for this  
301 could be that unmarried family members in urban areas are often dependent, and so are less  
302 likely to be allowed to use tobacco products at home [6, 12]. In contrast, and consistent with  
303 the findings in this study from rural areas, another study concluded that marital status was not  
304 associated with tobacco use at the household level in rural areas [14].

305

306 The lower-educational status of people in urban areas appeared to significantly contribute  
307 towards the use of tobacco at home. This could happen due to being deprived of a proper  
308 education, a lack of good jobs, and low economic status. This situation is related to reduced  
309 opportunities for smoking outdoors and where homes often come with the territory of socio-  
310 economic deprivation. Lower-educated people also often overestimate their tobacco use based

311 on various socio-cultural misconceptions [6, 12, 14]. The findings in this study are also  
312 consistent with other multinational studies conducted in similar setting [26, 27].

313

314 Though family type was not associated with tobacco use at home in urban areas, participants  
315 living with extended family in rural areas were three times more likely to use tobacco at home.

316 In comparison to a study carried-out with Nigerian youths [28], the findings in this study

317 identified a higher chance of tobacco use at household level where children were being used to

318 buy or carry tobacco, or to light the cigarettes or pipes. However, the risk of initiating tobacco

319 use at home was higher among those families where older family members already had the

320 smoking habit. Other studies conducted in developed and developing countries identified that

321 youngsters usually followed in the footsteps of older family members, including their parents,

322 that made them more likely to take up smoking in order to show themselves as older or grown

323 up [29, 30, 31, 32].

324

325 Those households in rural areas that showed a lack of family guidance on the overall negative  
326 consequences of tobacco products had a more than four times likelihood of using tobacco.

327 Similar findings were observed in other developing countries. A study conducted in Vietnam,

328 for example, showed that family guidance and interactions related to smoking behaviours had

329 a strong influence on a smoker's intention to quit [33]. However, this was found to be a non-

330 significant predictor in the urban setting for this study. Evidence further suggests that the

331 cultural practice of offering tobacco as part of leisure and entertainment activities at household

332 level was almost two times riskier in urban areas and three times riskier in rural areas for

333 continuing the use of tobacco products (especially SLTs). Another study conducted in the urban

334 areas of Bangladesh reported that SLT use is perceived as a traditional part of hospitality and

335 is practiced widely at social gatherings such as weddings, baby shower ceremonies, religious  
336 events and other occasional festivals [13].

337

338 This study found there is a significant association between tobacco use and regular religious  
339 practices both in urban and rural areas. The findings indicate that those participants that  
340 regularly practiced religious activities (such as praying, fasting, donating to charity and reading  
341 religious books) were less likely to use tobacco at home. This finding is consistent with other  
342 recently conducted studies that also found those individuals that engaged in regular religious  
343 practices were more restrictive in their use of tobacco or alcohol mainly because such practices  
344 are discouraged by almost all conventional religions due to their addictive nature and the  
345 explicit physical harms they can cause [34, 35]. In many parts of the USA, however, tobacco  
346 use is not influenced by religion but rather considered to have an important role in local rituals,  
347 and to be an essential part of cultural traditions [36, 37].

348

349 This study has conducted a comparative analysis of familial and socio-cultural barriers to  
350 enabling tobacco free homes in urban and rural areas, but it does not put forward any causal  
351 associations and suggests that an observational study is likely to be more useful for assessing  
352 any causal linkage. However, the samples in this study have been included in a systematic  
353 manner for both urban and rural areas and therefore provided a comprehensive overview of the  
354 prevailing constraints and barriers that hinder the enablement of tobacco free homes in  
355 Bangladesh. A generalisation of similar scenarios of the socio-familial barriers to creating  
356 tobacco free homes could be applied to other areas of the country.

357

358 This study also provides baseline information that can be used by policy makers, researchers  
359 and national and international agencies to help the understanding of similar scenarios in a

360 broader context and therefore also help in the development of necessary policies. The findings  
361 from this study can be useful in three areas. Firstly, they can be used to help design and deliver  
362 appropriate interventions, anti-tobacco campaigns and other promotional activities that may,  
363 in turn, be useful for creating a lasting impact on awareness among the whole population about  
364 the consequences of tobacco use at home for people in both urban and rural areas. Secondly,  
365 the findings provide insights for local authorities and NGOs, when they are planning and  
366 initiating any home-based measures such as creating a model of ‘Tobacco Free Homes,’ with  
367 a special focus on periodic parental guidance and counselling and building good family ties so  
368 that they can share any problems among family members. Thirdly, the findings can influence  
369 policies around religious based interventions such as training of *Imams* (religious leaders in  
370 Islam) and clergymen, who could encourage the regularizing of religious practices at family  
371 level during their *Khutba* (a large weekly gathering of Muslims) that ultimately could lead to a  
372 reduction of tobacco use in the home.

373

## 374 **CONCLUSION**

375 This study found that the overall prevalence of tobacco use at home (smoking or SLT) is higher  
376 in rural areas (nearly half) than it is in urban areas (one-fourth) and represents an alarming  
377 public health issue for Bangladesh. It also reveals that age is an important factor for using  
378 tobacco at home - adults aged 30 or above are more likely to do this and it is more prevalent in  
379 rural than urban areas. Familial and social factors such as the smoking habits of family  
380 members, tobacco being offered as part of a cultural tradition of leisure and entertainment,  
381 children being used to buy or carry tobacco or for lighting cigarettes, and the lack of religious  
382 practice all contribute to continued tobacco use at home in both urban and rural areas. A number  
383 of factors in rural areas such as, living with the extended family and lack of family guidance  
384 on the consequences of using tobacco, were shown to be leading predictors of its use at home.

385

386 Strengthening the national commitment to controlling the use of tobacco at home, and the  
387 emerging threat of second-hand smoke exposure, is essential. It is time to adopt a  
388 comprehensive approach for cessation and for appropriate laws to be devised that would ensure  
389 homes are made smoke free. A mass media campaign should be geared up to urge change in  
390 the idea of smoking at home being socially acceptable as has already been carried out in many  
391 other countries of the world.

392

393

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399

400 **Conflict of interests**

401 Authors have declared that there is no conflict of interest.

402

403 **Data sharing statement**

404 There is no additional data available.

405

406 **Authors' contributions**

407 MIH contributed to the development of the overall study concept, design, analysis, and writing  
408 the first draft of the paper. TA and TT were involved in data acquisition and analysis. AAC  
409 was involved in designing the study and developed the questionnaire. MKH and AAM were  
410 actively performed the data coding and analysis and HTAK was involved in statistical part of  
411 the analysis. ANZU was involved in refining the results section, reviewed the whole manuscript  
412 and contributed substantially to improve it, and will act as corresponding author. MGDH was  
413 involved with MIH in design and preparing data collection tool. All authors contributed equally  
414 in analysis, interpretation and writing the manuscript. All the authors have read the manuscript  
415 thoroughly and approved its contents.

416

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- 514

515

516 **Figure legends:**

517 **Figure 1. Multi-staged probability proportional sampling strategy.**

518 **Figure 2. Prevalence of tobacco use at home by participants and other family members**  
519 **in the urban and rural areas.**

520

521