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# Awareness of health warnings and factors predicting awareness and perceived effectiveness of pictorial health warnings on tobacco products among adults in rural Puducherry, India

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## Abstract:

**BACKGROUND:** Limited information exists in India about the awareness and perception of the people regarding pictorial health warnings (PHWs) and text warnings on tobacco products, more so from rural areas. Objectives were to report the awareness of these warnings, factors predicting awareness and perceived effectiveness of PHWs, and understanding of their content in a rural population.

**MATERIALS AND METHODS:** A community-based cross-sectional study was conducted in two villages (chosen randomly out of total four) in the rural field practice area of a tertiary care teaching hospital in Puducherry. Households were selected by systematic random sampling. All persons  $\geq 18$  years and residing in the area for at least 6 months were included. Data regarding awareness and perception of participants was collected through a semi-structured interview schedule.

**RESULTS:** A total of 428 participants were recruited; 197 (46%) were male, and 231 (54%) were female. The mean age of the participants was 38.9 (standard deviation 15.0) years. Awareness of PHWs and text warnings was 39.5% (169/428) and 21% (90/428), respectively. Only 11.2% participants perceived PHWs as effective. Most (45%) of the participants had a vague understanding of the content of PHWs. On multivariate logistic regression, male gender, current tobacco use, and better education emerged as predictors of greater awareness of PHWs. Extended family predicted greater perceived effectiveness of PHWs, whereas, high socioeconomic class and middle school completion predicted lower perceived effectiveness of PHWs.

**CONCLUSION:** Awareness and perceived effectiveness of adults in rural Puducherry regarding PHWs were low. There is a need to create awareness through education and using meaningful, larger pictures.

## Keywords:

Awareness, perception, pictorial, tobacco, warnings

## Introduction

Whereas the prevalence of tobacco use has declined progressively in many developed countries, its prevalence in developing countries like India has increased over the past few decades. The economic

loss due to the morbidity and mortality resulting from tobacco use is enormous. For instance, in India, in the year 2011, the total economic cost attributable to tobacco use from all diseases amounted to US\$ 22.4 billion for persons aged 35–69 years;

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16% of this being direct cost.<sup>[1]</sup> According to the National Family Health Survey-3 (NFHS-3), 2005–2006, 61% males and 13% females in rural areas were found to use some form of tobacco, whereas the corresponding figures for urban areas were 50% and 7% for males and females respectively.<sup>[2]</sup> Similarly, the Global Adult Tobacco Survey (GATS) also reported a higher prevalence of tobacco use in rural India as compared to urban areas.<sup>[3]</sup> Around 35% adult males in rural areas smoke cigarette or bidis, and nearly 40% use some smokeless form such as paan masala, gutkha, or other chewed tobacco products as per NFHS-3 reports.

The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, and Supply and Distribution) Act, 2003 mandates the presence of health warnings on tobacco products sold in India.<sup>[4]</sup> In a study from Qatar, 55% and 67% of the urban population was found to be aware of pictorial health warnings (PHWs) and text warnings respectively.<sup>[5]</sup> Acknowledging the lower literacy rate of the Indian population in rural areas, it can well be expected that the awareness levels will be lower. A Mexican study showed that having seen health warnings increased the awareness regarding even less well-known health risks of smoking.<sup>[6]</sup> Studies from China, Thailand, and Malaysia have shown that PHWs were rated as more effective as compared to the text warnings and have resulted in increased intention to quit smoking.<sup>[7-9]</sup> As per the notification issued by the Government of India (GoI) in 2010, the health warnings on packets of tobacco products usually carry a picture of scorpion on smokeless forms of tobacco, and a picture of diseased lungs or a X-ray of lungs with cancer on smoked forms of tobacco.<sup>[10]</sup> PHWs can break language and cultural barriers, especially in a multicultural country like India, and thus can overcome the limitations of textual warnings. As per the WHO Framework Convention on Tobacco Control, the health warnings on tobacco products should be large, clear, visible, legible, and should cover 50% or more of the principal display areas.<sup>[11]</sup> As per GoI, the health warnings should cover at least 40% of the principal display area.<sup>[12]</sup> There has been recent controversy in India regarding increasing the size of PHWs further to 85%, and many national and international nongovernmental organizations have advocated for this.<sup>[13,14]</sup>

Limited research has so far been carried out in India regarding the pictorial and text warnings present on tobacco products. Also, most of the previous research has focused on the awareness and perception of smokers from urban areas. One Indian study conducted in Bellary, Karnataka showed that the awareness of urban smokers was 1.6 times higher than the rural smokers and that urban residence has independently predicted

the awareness levels.<sup>[15]</sup> There is limited information on awareness and the perceived understanding of the general population living in rural parts of India (where two-thirds of India's population reside) where tobacco use is higher as compared to urban areas.

The primary objectives of the present study were thus, to study the awareness of pictorial and text warnings used on tobacco products among adults residing in a rural area, to understand their perception regarding the impact of pictorial warnings on tobacco consumption, and to find out the independent factors predicting the awareness and perceived effectiveness of pictorial warnings. The secondary objective was to find out their understanding of the type and content of pictorial warnings used.

## Materials and Methods

The present study was a community-based cross-sectional study conducted among the residents of two villages of during January and February 2015. These two villages were selected randomly out of total four villages under the field service area of a Rural Health Centre (RHC) attached to a tertiary care teaching hospital in Puducherry. This RHC caters to a population of about 9000 in four villages namely, Ramanathapuram, Pilliyarkuppam, Thondamanatham, and Thuthipet, providing primary health care services.

Considering the awareness of PHWs as 59.2% and 68.8% for smoked and smokeless forms among people from a previous Indian study,<sup>[16]</sup> absolute precision of 5%, and 10% refusal rate, the minimum sample size required was 425 (going for the higher sample size obtained). All adult persons (18 years and above) and residing in the service area for at least 6 months, were included in the study. Within each household, all adult male and female members were approached and those eligible and available were recruited in the study. Two additional visits were made to track persons who were eligible, but not available at the time of first visit. If an eligible person could not be contacted even after two additional visits, they were not included in the study. To get 425 participants, it was planned to recruit 213 participants from each of the two villages. Assuming each household to have three adult members on an average, 71 households were selected from each village. Within the villages, households were selected by systematic random sampling.

The data were collected using a pilot-tested semi-structured interview schedule originally developed by the investigators in English. The same was translated in Tamil (translation and back translation to English was done). The information regarding sociodemographic characteristics, personal history, and awareness and

perception regarding pictorial and text warnings present in tobacco products was obtained from the study participants. Informed consent was obtained from all the study participants. All participants using tobacco products were given health education on an individual basis to decrease their consumption. At the end of the study, all participants were shown pictorial and text warnings present on tobacco products and were explained regarding the meaning and importance of these warnings.

Current tobacco and alcohol use were defined as any history of tobacco or alcohol use within 1-month preceding the date of survey. A participant was taken to be aware of pictorial/text warning if he/she had ever seen a pictorial/text warning in his/her lifetime and remembered it. Participants who were aware of PHWs were asked two open-ended questions to find out their awareness regarding the type of pictures used in warnings and their understanding of the pictorial content used. These were: (a) What picture do you remember to have seen mostly (specify separately for smoked and smokeless forms) and (b) what do you think was the meaning of that picture? Those who were not aware, were shown currently used pictorial warnings on tobacco products available locally, and their opinion and perception was also taken (in addition to those who were aware) regarding size of the warnings, their effectiveness, and whether any other form of pictorial representation is needed.

Data were entered in EpiData version 3.1 (The EpiData Association, Odense, Denmark) and was analyzed using SPSS version 17.0 [SPSS Inc., Chicago]. Univariate analysis (using logistic regression) was conducted to find out the association of awareness of pictorial warning with sociodemographic variables and personal history of the study participants. Similarly, an association of perception regarding the effectiveness of pictorial warning and the above-mentioned variables was also tested, and unadjusted odds ratios were calculated. Variables significantly associated ( $P < 0.05$ ) during univariate analysis were included in the multivariate analysis to find out the independent predictors of awareness and effectiveness of pictorial warning.

## Results

A total of 428 participants were recruited for the study. Out of them, 197 (46%) were male, and 231 (54%) were female. The mean age of the study participants was 38.9 (standard deviation [SD] 15.0) years. The sociodemographic characteristics of the study participants are shown in Table 1. Most (71.7%) of the participants belonged to a younger age group that is, 18–45 years. The majority of the participants were currently married,

belonged to extended families and higher socioeconomic class. Almost one-third participants were homemakers, and another one-third was either farmers or daily wage laborers.

Around 39% of all the males had taken alcohol within the last month; none of the females had a history of alcohol use though (data not shown). Overall, 155 (36.2%) participants had ever used any tobacco product (smoked or smokeless). Out of them, 56.4% of participants had used smoked form, the rest using smokeless forms. The mean age of starting tobacco product usage was 26.4 (SD 10.3) years. Gender-wise, around 62% of males and 14.3% of females had ever used any tobacco product. All the females and 30.3% of males had used smokeless forms of tobacco.

**Table 1: Sociodemographic characteristics of the study participants**

Variable	n (%)
Age (in years)	
18-30	148 (34.6)
31-45	159 (37.1)
46-60	81 (18.9)
>60	40 (9.3)
Gender	
Male	197 (46.0)
Female	231 (54.0)
Education	
No formal education	50 (11.7)
Primary school completed	90 (21.0)
Middle school completed	96 (22.4)
High school completed	82 (19.2)
Higher secondary completed	79 (18.5)
Graduate or postgraduate	31 (7.2)
Occupation	
Homemaker	139 (32.5)
Daily wage laborer	95 (22.2)
Farmer	51 (11.9)
Student or unemployed	71 (16.6)
Others*	72 (16.8)
Marital status	
Unmarried	68 (15.9)
Currently married	309 (72.2)
Widow/divorced/separated	51 (11.9)
Socioeconomic class (modified BG Prasad classification)*	
V-lower	3 (0.7)
IV-lower middle	16 (3.7)
III-middle	57 (13.3)
II-upper middle	204 (47.7)
I-upper	148 (34.6)
Family type	
Nuclear	187 (43.7)
Extended	241 (56.3)

\*Almost half of them had some business of their own, rest worked as drivers, cooks, mechanics, painters, and in shops, #Revised Prasad's social classification, 2013

The proportion of participants aware of pictorial and text warnings were 169/428 (39.5%) and 90/428 (21%) respectively [Figure 1]. Around 15%, (66/428) participants opined that the size of pictorial warnings used currently should be increased further, with a higher proportion of females having this feeling as compared to males. Out of these 66 participants, the majority (60.6%) opined that size should be increased to 75% or more; another 37.9% participants opined that it should be more than 50%. Only 48/428 (11.2%) participants believed that the current pictorial warnings were effective, though only around 3% (13/428) participants opined that some other form of pictorial representation is needed.

Seven out of 155 ever users of tobacco reported a decrease in the frequency of tobacco use after seeing the pictorial warning and ascribed the decrease to PHW (data not shown). Similarly, 28.9% (79/273) nonusers of tobacco reported that they had motivated either their spouse (36/79), any other family member (10/79), a friend (26/79), or a distant relative (7/79). Reduction in frequency of use after motivation was reported to be observed in 16 persons out of total 79 motivated.

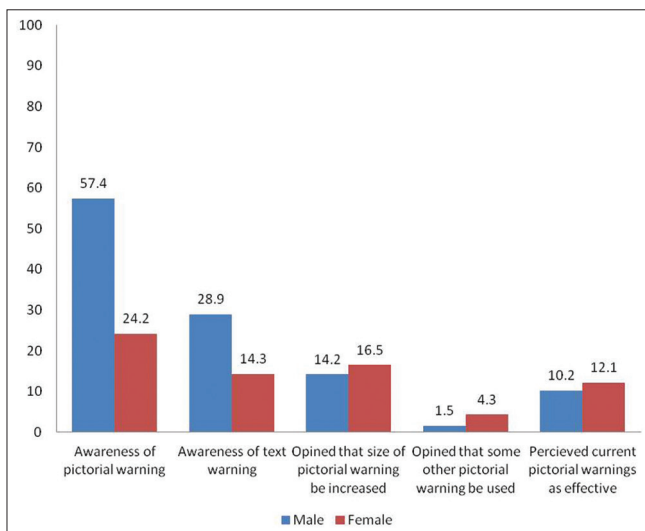


Figure 1: Awareness and perception of participants regarding usefulness of health warnings

Among the participants who were aware of pictorial warnings, the majority (30.7%) recalled having seen the pictures of diseased, damaged or black lungs [Figure 2]. Regarding understanding of the content, most (around 45%) of the participants felt that the picture meant that the tobacco use is dangerous/bad/injurious for health. Around 38% of participants believed that the picture was depicting some cancer.

Univariate analysis showed that all the sociodemographic and personal history variables were significantly associated ( $P < 0.05$ ) with awareness regarding the pictorial warning except the history of the chronic disease [Table 2]. Hence, all variables except the chronic disease history were included in the multivariate analysis. The mean age at which the participants became aware of pictorial warnings was 23.9 (SD 10) years. As shown in Table 3, while analyzing for effectiveness of pictorial warning, only three variables namely family type, socioeconomic status, and education were significantly associated ( $P < 0.05$ ) in univariate analysis and thus were included in the final multivariate model.

Table 4 shows that being male, being a user of tobacco, and having completed higher secondary and above education acted as independent predictors of higher awareness levels of pictorial warnings among the study participants. Belonging to extended family type, independently predicted the higher level of perceived effectiveness of pictorial warning among the participants. Similarly belonging to a lower socioeconomic class and having completed middle school were independent predictors of low perceived effectiveness of PHWs.

## Discussion

In the present study, the awareness level of participants regarding PHWs was almost twice (39.5%) as that of text warnings (21%). In a previously conducted Indian study, among males, around 69% and 76% males had ever seen PHWs on smoked and smokeless forms respectively, whereas among females it was 31% and 47% respectively.<sup>[16]</sup> In the same study, the proportion of males who had read text warnings among smoked and

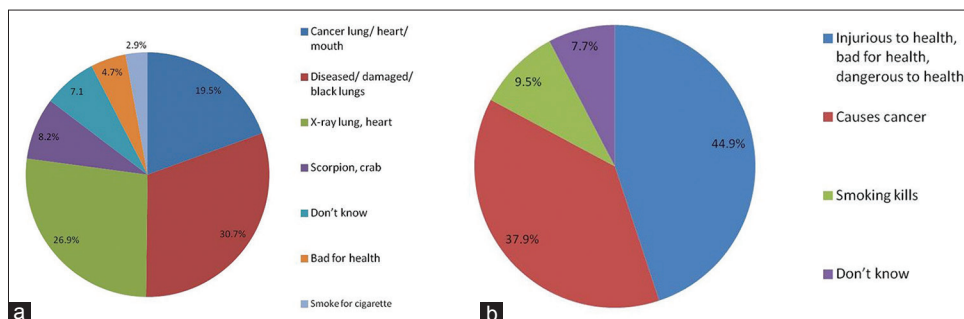


Figure 2: (a) Participants awareness of the type of pictorial warnings used,  $n = 169$ . (b) Participants understanding of the content of pictorial warnings,  $n = 169$

**Table 2: Univariate analysis showing the association between awareness of PHWs and sociodemographic and personal characteristics**

Category	Aware (%)	Not aware (%)	OR (95% CI)	P
<b>Age</b>				
18-30	71 (42)	77 (29.7)	3.7 (1.6-8.5)	0.002*
31-45	67 (39.6)	92 (35.5)	2.9 (1.3-6.7)	0.01*
46-60	23 (13.6)	58 (22.4)	1.6 (0.6-4.0)	0.32
>60	8 (4.7)	32 (12.4)	-	-
<b>Gender</b>				
Male	113 (66.9)	84 (32.4)	4.2 (2.8-6.4)	<0.001*
Female	56 (33.1)	175 (67.6)	-	-
<b>Education</b>				
No formal education	9 (5.3)	41 (15.8)	-	-
Primary school completed	16 (9.5)	74 (28.6)	0.9 (0.4-2.4)	0.97
Middle school completed	39 (23.1)	57 (22.0)	3.1 (1.4-7.1)	0.007*
High school completed	38 (22.5)	44 (17.0)	3.9 (1.7-9.1)	0.001*
Higher secondary completed	42 (24.9)	37 (14.3)	5.2 (2.2-12.1)	<0.001*
Graduate or postgraduate	25 (14.8)	6 (2.3)	19.0 (6.0-59.7)	<0.001*
<b>Occupation</b>				
Homemaker	29 (17.2)	110 (42.5)	-	-
Daily wage laborer	40 (23.7)	55 (21.2)	2.8 (1.6-4.9)	0.001*
Farmer	20 (11.8)	31 (12.0)	2.5 (1.2-4.9)	0.012*
Student or unemployed	33 (19.5)	38 (14.7)	3.3 (1.8-6.1)	<0.001*
Others	47 (27.8)	25 (9.7)	7.1 (3.8-13.5)	<0.001*
<b>Marital status</b>				
Unmarried	40 (23.7)	28 (10.8)	5.9 (2.5-13.6)	0.001*
Currently married	119 (70.4)	190 (73.4)	2.6 (1.2-5.3)	0.01*
Widow/divorced/separated	10 (5.9)	41 (15.8)	-	-
<b>Socioeconomic class (modified BG Prasad classification)</b>				
V	74 (43.8)	74 (28.6)	-	-
IV	70 (41.4)	134 (51.7)	0.5 (0.3-0.8)	0.003*
III	16 (9.5)	41 (15.8)	0.4 (0.2-0.8)	0.005*
II	7 (4.1)	9 (3.5)	0.8 (0.3-2.2)	0.635
I	2 (1.2)	1 (0.4)	2.0 (0.2-22.5)	0.575
<b>Family type</b>				
Nuclear	56 (33.1)	131 (50.6)	-	-
Extended	113 (66.9)	128 (49.4)	2.1 (1.4-3.1)	0.001*
<b>Tobacco use</b>				
Current user	91 (53.8)	64 (24.7)	3.6 (2.4-5.4)	0.001*
Not a current user	78 (46.2)	195 (75.3)	-	-
<b>Alcohol use</b>				
Current user	75 (44.4)	53 (20.5)	3.1 (2.0-4.8)	0.001*
Not a current user	94 (55.6)	206 (79.5)	-	-
<b>History of chronic disease</b>				
Present	40 (23.7)	66 (25.5)	-	-
Absent	129 (76.3)	193 (74.5)	1.1 (0.7-1.7)	0.67

PHWs = Pictorial health warnings, CI = Confidence interval, OR = Odds ratio, P <= 0.05 - \*Significant

smokeless products was 63% and 53%, respectively; the corresponding values for females being 26% and 23% respectively. Similarly, a study from Qatar reported that around 55% and 67% of the general population were aware of PHWs and text warnings respectively.<sup>[5]</sup> Both the abovementioned studies were carried out in either urban or suburban areas (where people are better educated) as compared to our study which was conducted in rural areas. This, along with different

population characteristics, for instance, differing socioeconomic status, and methodological differences could be the reason for lower awareness levels observed in our study. Our study was similar to the Indian study in the fact that awareness for PHWs was higher than the text warnings and awareness among males regarding PHWs was higher than females. An earlier research had shown that only around 11% of women residing in urban slums in Mumbai had seen any pictorial warnings ever.<sup>[17]</sup>

**Table 3: Univariate analysis showing the association between perceived effectiveness of PHWs and sociodemographic and personal characteristics**

Category	Effective (%)	Not effective (%)	OR (95% CI)	P
<b>Age</b>				
18-30	22 (45.8)	126 (33.2)	2.2 (0.6-7.6)	0.23
31-45	15 (31.3)	144 (37.9)	1.3 (0.4-4.7)	0.70
46-60	8 (16.7)	73 (19.2)	1.4 (0.3-5.4)	0.67
>60	3 (6.3)	37 (9.7)	-	-
<b>Gender</b>				
Male	20 (41.7)	177 (46.6)	0.8 (0.0.5-1.5)	0.52
Female	28 (58.3)	203 (53.4)	-	-
<b>Education</b>				
No formal education	5 (10.4)	45 (11.8)	-	-
Primary school completed	8 (16.7)	82 (21.6)	0.9 (0.3-2.8)	0.83
Middle school completed	4 (8.3)	92 (24.2)	0.4 (0.1-1.5)	0.18
High school completed	9 (18.8)	73 (19.2)	1.1 (0.4-3.5)	0.86
Higher secondary completed	14 (29.2)	65 (17.1)	1.9 (0.7-5.8)	0.23
Graduate or postgraduate	8 (16.7)	23 (6.1)	3.1 (0.9-10.7)	0.07
<b>Occupation</b>				
Homemaker	15 (31.3)	124 (32.6)	-	-
Daily wage labourer	8 (16.7)	87 (22.9)	0.8 (0.3-1.9)	0.55
Farmer	4 (8.3)	47 (12.4)	0.7 (0.2-2.2)	0.55
Student or unemployed	6 (12.5)	65 (17.1)	0.8 (0.3-2.1)	0.59
Others	15 (31.3)	57 (15.0)	2.2 (0.9-4.8)	0.051
<b>Marital status</b>				
Unmarried	7 (14.6)	61 (16.1)	1.8 (0.5-7.5)	0.40
Currently married	38 (79.2)	271 (71.3)	2.2 (0.7-7.6)	0.19
Widow/divorced/separated	3 (6.3)	48 (12.6)	-	-
<b>Socioeconomic class (modified BG Prasad classification)</b>				
V	31 (64.6)	117 (30.8)	-	-
IV	12 (25.0)	192 (50.5)	0.2 (0.1-0.5)	<0.001*
III	4 (8.3)	53 (13.9)	0.3 (0.1-0.9)	0.02*
II	0 (0)	16 (4.2)	NA	NA
I	1 (2.1)	2 (0.5)	1.9 (0.2-21.5)	0.61
<b>Family type</b>				
Nuclear	12 (25.0)	175 (46.1)	-	-
Extended	36 (75.0)	205 (53.9)	2.6 (1.3-5.1)	0.007*
<b>Tobacco use</b>				
Current user	13 (27.1)	142 (37.4)	0.62 (0.3-1.2)	0.17
Not a current user	35 (72.9)	238 (62.6)	-	-
<b>Alcohol use</b>				
Current user	16 (33.3)	112 (29.5)	1.2 (0.6-2.3)	0.58
Not a current user	32 (66.7)	268 (70.5)	-	-
<b>History of chronic disease</b>				
Present	11 (22.9)	95 (25.0)	-	-
Absent	37 (77.1)	285 (75.0)	1.1 (0.6-2.3)	0.75

PHWs = Pictorial health warnings, CI = Confidence interval, OR = Odds ratio, NA = Not available, P <= 0.05 - \*Significant

We found that around 60% of tobacco users were aware of PHWs. This was comparable to a study conducted among smokers in Bellary city of India, in which around 66% of the smokers in rural areas were aware of PHWs.<sup>[15]</sup> The fact that the users of tobacco products have obvious higher chances of coming across PHWs and taking them more seriously as compared to nonusers explains this finding. Nonusers of tobacco products usually come across text warnings and PHWs on packets of tobacco products lying at home (if there

is a smoker in the family), at roadsides (thrown away empty packets), in shops (while purchasing other items), and in advertisements. It is important to understand the awareness and perception regarding PHWs among nonusers of tobacco products (in addition to users) as they also act as motivators to decrease/quit use of tobacco.

Our finding that better education status was associated with greater awareness of PHWs is consistent with the

**Table 4: Multivariate analysis showing predictors of awareness and perceived effectiveness among participants**

Variable	Adjusted OR (95% CI)	P
Predictors of awareness		
Gender		
Male	2.3 (1.1-5.0)	0.04*
Tobacco use		
Current user	6.3 (3.2-12.7)	<0.001*
Education		
Higher secondary completed	5.6 (1.2-25.5)	0.03*
Graduate or postgraduate	20.4 (3.5-118.0)	0.001*
Predictors of perceived effectiveness		
Family type		
Extended	2.8 (1.3-6.2)	0.01*
Socioeconomic class (modified BG Prasad classification)		
IV	0.2 (0.1-0.5)	<0.001*
III	0.3 (0.1-0.9)	0.03*
Education		
Middle school completed	0.1 (0.03-0.6)	0.007*

CI = Confidence interval, OR = Odds ratio,  $P \leq 0.05$  - \*Significant

Bellary study, although this study was conducted only among smokers. Sometimes, the text messages are not printed in the local language on tobacco products and are an important barrier for those who are able to read local language only. Previous research has shown people preferring text messages in the local language.<sup>[18]</sup> This is an important reason for preference of PHWs especially by those not knowing English or Hindi.

In our study, only around 11% of participants perceived the current PHWs as effective, with a larger proportion of females perceiving it as effective as compared to males. A previous study also reported females to be more impressed with PHWs as compared to males.<sup>[19]</sup> We found that those who had better education perceived the current PHWs to be more effective, though this was not significant in multivariate analysis apart from completion of middle school. This was in contrast to a Brazilian study, where participants with lower education found PHWs to be more emotionally aversive than those with higher education.<sup>[20]</sup>

In our study, the majority of study participants perceived the meaning of PHWs as dangerous/bad/injurious for health. These vague responses show that the current PHWs might not be effective in bringing a positive behavioral response. Similar perception was observed among women tobacco users (smokeless) in urban slums of Mumbai, who interpreted picture of scorpion as harmful to health.<sup>[17]</sup> Images of a scorpion, X-ray lung, and diseased lungs have been reported to be either not understood or poorly understood by the people in India.<sup>[16]</sup> It has been felt earlier by the people

that stronger and scarier PHWs are needed to make these more effective.<sup>[18,21]</sup>

The issue of the effective size of PHWs has already been recognized. In an analysis of 37 brands of tobacco (smoked and smokeless), no pictorial warnings were present on packets of 5 brands, and 15 brands had representation on <40% of the main surface area.<sup>[22]</sup> In earlier studies, the majority (around 75–95% in two Indian studies) of people had opined that a larger size of the picture than the current size should be used.<sup>[16,21,23]</sup> This was in sharp contrast to our study where only 15% opined to have larger pictures. This finding could be because of the fact that many of the rural people may not have seen larger PHWs on costlier brands, thus resulting in their feeling that the pictures on local brands are sized accurately. However, almost, all the participants who believed that size of the current PHWs should be increased also opined that PHWs should cover over 50% of the display area.

Results of the GATS survey showed that around 30% of adult current (last 1-month) tobacco users in rural India thought of quitting tobacco after seeing a warning label.<sup>[3]</sup> While this looks fairly impressive, the actual decrease in tobacco use might be far lower. A systematic review concluded that the effect of PHWs on human behavior is modest and that there is a need to understand the single impact of PHWs on human behavior through methodologically stronger studies.<sup>[24]</sup> We found that only 7 out of 155 current users of tobacco reported a decrease in the frequency of tobacco use after seeing the PHWs in our study. In a multi-country study in the European Union, a higher proportion of current smokers had reported either cutting down a number of cigarettes/day or making a quit attempt.<sup>[25]</sup> This could be because of the fact that people in countries of the European region generally belong to a higher socioeconomic class along with the higher education levels, as compared to India, and thus, the chances of warnings having effect on quit attempts is higher among smokers in those countries. In another study, 14% of smokers reduced smoking, and 5% attempted to quit smoking after seeing health warnings on cigarette packs (both pictorial and textual).<sup>[19]</sup>

An important limitation of our study was the cross-sectional study design which does not allow determining the direction of causality detected through the associations with absolute certainty. Bias due to the social desirability is another issue, which might have resulted in an overestimation of awareness levels. However, the social desirability is expected to be significantly more among tobacco users and may not be that high for nonusers. An element of recall bias also cannot be ruled out as the reference period for awareness was “ever seen in a lifetime,” and because the

understanding of the pictorial content was based on this. An alternate way of studying this could have been by showing the PHWs to participants separately and then checking their understanding of each. But we did not do this as we presumed that perceived understanding of the pictures that is retained in their memory would have had more impact on their minds as far as tobacco use is concerned. There is also a possibility of differential recall where tobacco users might have recalled the warnings better than the nonusers.

## Conclusion

We found that the level of awareness of PHWs among adults in the study area was around 40% and was almost double that of text warning. About 15% people felt the need for increasing the size of currently used PHWs, almost all of them feeling that the picture should be covering more than 50% of the principal display area. Only around 1 in 10 persons perceived the currently used PHWs as effective. Most of the participants had vague understanding of the pictorial content. Male gender, current users of tobacco and those having higher education had a significantly higher awareness of PHWs. Extended family type acted as a predictor for the higher level of perceived effectiveness of PHWs, whereas, belonging to a higher socioeconomic class and having completed middle school were independent predictors of less perceived effectiveness of PHWs.

Awareness should be spread regarding PHWs among general population in rural areas, especially among females, nonusers of tobacco products as these people also serve as important links in the chain of motivation as spouse, friend, or relatives of the tobacco users. The opportunity for motivating the members of extended families should be taken to spread awareness and bring in a positive behavioral response of the tobacco users in the family.

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## Conflicts of interest

There are no conflicts of interest.

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