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Willingness to pay for a tobacco-free life: a contingent valuation assessment

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the study, monitoring the ethical compliance during the data collection and providing necessary institutional support.

Abstract

Tobacco, being an established risk factor for significant mortality and morbidity, causes over 7 million annual deaths globally. India is a country with over 270 million active tobacco users. On the one hand, although the willingness to quit amongst tobacco users is as high as 55.4%, the actual quit rates translate to less than 20%. Taking a cue from the economic principle of commitment and consistency, paying a nominal fee can serve as a form of public commitment and motivation to decrease the dropout rate amongst those committed to quitting. This study uses contingent valuation assessment to determine the willingness to pay (WTP) values for an effective tobacco cessation service across individuals with different socio-demographic characteristics. A cross-sectional observational study with multistage cluster sampling in Rajasthan was conducted to recruit 360 active tobacco users from 8 districts. Q-Q plots were used to determine the non-parametric distribution, and statistical differences between median WTP values were compared using Mann-Whitney U and Kruskal-Wallis H tests, considering a p-value less than 0.05 to be statistically significant. The majority of participants were males (57.78%) between the ages of 26 and 35 (40.28%), married (82.50%), and with children (65.83%), with an annual income between USD 7500-10,000 (23.61%) and graduate-level education (40.56%). Exclusive smokers formed the majority of the cohort (48.06%), and 50.83% were willing to quit as well as willing to pay for cessation. Median WTP values were maximum for males (USD 54.05; $p < 0.05$), age group 26-35 years (USD 54.05; $p < 0.05$), post-graduates (USD 81.08; $p < 0.05$), and annual income above USD 20,000 (USD 121.62; $p < 0.05$). Weak positive and significant correlations were observed between WTP and annual spending on tobacco, annual spending on health, and annual income. The study emphasizes the critical importance of early-age interventions for effective tobacco cessation prior to transitioning into dependency, resulting in reduced financial parity for availing health services. These are the first such WTP values from the Southeast Asian region, tailored for different population subsets, specifically for tobacco cessation. Our findings contribute to the growing body of evidence to support innovative approaches to enhance tobacco cessation efforts through financial commitments.

Key words: tobacco use cessation, smokers, India, health services.

Introduction

Tobacco consumption is an established risk factor for significant mortality and morbidity amongst its user base with over 8 million annual deaths globally [1]. It has also been shown that almost two-thirds of this burden is borne by the low- and middle-income countries (LMICs) alone [2], thus marking proven cessation strategies a crucial element for elimination of this public health hazard.

India is a country with over 270 million active tobacco users, with products spanning a wide variety across the smoked and smokeless categories [3]. Even with such high prevalence of 28.6% as per the Global Adult Tobacco Survey (2016-17), previous research studies indicate a high willingness to quit amongst the tobacco users, with values ranging between 49.7% to 55.4% [3-5]. It is interesting to note that despite such high willingness, the actual quitting rates translated to less than 20% due to factors such as lack of sustained motivation and accessibility to cessation services [6,7].

As per the recommendations of the World Health Organisation's Framework Convention on Tobacco Control, providing support to quit is an established area of intervention, which drives many ongoing interventions such as Quitline services. Despite the abundant availability and accessibility of such services, there remains high drop-out as well as relapse rates indifferent to the varied socio-demography of the country.

This study takes cue from the economic principle of commitment and consistency, which can be applied to the context of quitting tobacco for health benefits [8]. When individuals make a public commitment or express their willingness to pay a certain amount of money to quit smoking, they create a sense of personal responsibility and obligation to follow through on their commitment. In this scenario, asking individuals to make a financial commitment, such as paying a fee, can serve as a form of public commitment, through which, they are more likely to remain consistent with their initial decision and actively work towards quitting tobacco. The act of paying a fee reinforces their commitment to their health and increases their motivation to succeed.

Moreover, the willingness to pay to quit tobacco can also be seen as an investment in one's health. When individuals invest financially in something, they tend to assign more value to it and are more likely to stick with it, also known as the endowment effect [9]. In the case of quitting tobacco, the financial investment can serve as a motivating factor to stay committed and deter individuals from relapsing. Leveraging the commitment and consistency principle can potentially increase their motivation, commitment, and ultimately improve their chances of successfully quitting smoking.

Further, this study utilises the contingent valuation method to assess willingness to pay which is a proven method developed to elicit WTP for measuring the benefits of goods and services without markets. The method involves directly asking individuals about monetary value they are willing to place for any good or service in order to understand the demand for that particular service [9]. In recent times, the CVM is gaining more popularity by health economists to assess the prospective demands for health technologies [10-12].

Considering Rajasthan to be a state with one of the lowest age of initiation in the country having high consumption prevalence of all major forms of tobacco [13], this study was conducted to assess the willingness to pay for availing an effective tobacco cessation service through contingent valuation method.

Materials and Methods

This cross-sectional observational study was conducted between September 2022 and February 2023 in Rajasthan, which is a North Western Indian state. Multistage cluster sampling was carried in four geographic divisions of Rajasthan, to include daily tobacco users aged between 18 and 65 years of age. Inclusion criteria further comprised of history of daily tobacco use for more than one year [14], and participant to be an earning (non-dependent) individual, employed in any profession. Those persons who were addicted to any substance other than tobacco (*afeem, hash, doda, smack, etc.*) were excluded to minimise the misrepresentation of willingness to pay values, and those who were not residents of the selected districts were excluded to ensure equal representations of each of the selected geographical cluster. Two districts were selected from all four regions of Rajasthan, namely i) Western Sandy Plains, ii) Aravalli Hilly Region, iii) Eastern Plains and iv) South-Eastern Pathar [15], and, 5 tobacco vendors each from rural and urban regions were selected, who sold all three forms of tobacco (cigarettes, bidis and SLTs) to ensure the multistage cluster design. Data was collected by interviewing tobacco users visiting the selected vendors who gave consent for participation in the study.

Sample size was calculated using the formula for cross-sectional studies ($z^2 \cdot PQ/L^2$), where, confidence level was considered at 95%, prevalence of willingness to quit amongst tobacco users was considered as 11.6% for Rajasthan [3], and absolute precision was taken as 5%. The obtained sample size was further accounted for a 10% non-response rate and a design effect of 2, to arrive at a final sample size of 347. (The sampling strategy is explained in the flowchart in *Supplementary Figure 1*).

A semi-structured google form-based questionnaire was used for data collection using skip patterns and piloted for content validity. Those who were willing to participate but unable to

spare time during the visit to the tobacco vendor were provided google form links, while, for those who were willing but unable to use the google form, physical questionnaire was filled and later updated in the spreadsheet by the same interviewer. To ensure responsiveness and equal distribution of participants, telephonic message reminders were given to consenting individuals for form submission.

After obtaining the sociodemographic information and tobacco use related history, responses on willingness to pay were prompted after explaining the benefits of quitting tobacco, and the asking the participants the amount which they would be willing to pay, for a method that would guarantee tobacco cessation, if used by them. For the descriptive analysis, the tobacco users were categorised based on their socio-demographic profile, including annual income, gender, age groups, marital status, and having or not having children. History of tobacco use was further described in terms of type of tobacco product (bidi, cigarette or smokeless tobacco) used, willing or unwilling to quit and willingness to pay for cessation method. Furthermore, information was also collected on annual spending on tobacco products as well as frequency and spending on any medical help sought due to a sickness experienced due to tobacco use. For data analysis, Q-Q Plots were used and a non-parametric distribution of the willingness to pay dependent variable was recorded. Thus, for descriptive analysis, median and interquartile ranges were used and statistical differences between variables was compared using Mann-Whitney U test and Kruskal-Wallis H test. P-value <0.05 was considered statistically significant and Microsoft Excel (2019) and SPSS (v23) were used for statistical analysis.

Ethical clearance was obtained from the Institutional Ethical Committee of AIIMS Jodhpur. Data collection was done after signing of the consent forms and due appraisal of the study objectives to all participants through participant information sheets.

Results

The characteristics of the sample population have been described in Table 1. Majority of the study participants (57.75%; 208) were males and 40.28% (n = 145) belonged to the age group between 26 to 35 years. Majority had completed graduate level education (n = 146; 40.56%), 297 (82.50%) participants were married and most of them belonged to the annual income group of 7,500 to 10,000 USD (income groups derived from Modified Kuppaswamy Scale, 2021 and converted to USD equivalent to mid-year INR for 2021; USD 1 = INR 73.9) [16]. Study participants were predominantly exclusive smokers (173; 48.06%) and from a total of 217 participants (60.28%) willing to quit tobacco, 183 (50.83%) were willing to pay for a cessation tool that would assure them successful quitting.

After determination of non-parametric nature of the willingness to pay values through Q-Q plot (*Supplementary Figure 2*), median WTP values and respective interquartile ranges were plotted for various independent variables (*Supplementary Figures 3-9*). Against the overall median WTP value of USD 40.54 (IQR: USD 16.22-118.24) for the study sample, maximum WTP values were observed amongst males (USD 54.05; 24.32-108.11), age group of 26-35 years (USD 54.05; 27.03-175.68), having post-graduate education level (81.08; 27.03-216.22), married individuals (USD 40.54; 18.92-121.62), those not having children (USD 52.70; 16.22-135.14), earning more than 20,000 USD eq. INR per annum (USD 121.62; 67.57-270.27) and those who were exclusive smokers (USD 52.70; 16.22-135.14).

Considering the potential policy implications of the study findings, tests to determine significant differences amongst variables were conducted for gender, age groups and income groups. Mann-Whitney U Test showed statistically significant difference between willingness to pay values for males and females ($p < 0.001$) and Kruskal-Wallis H test indicated significant difference in the dependent variable for different age and income groups as well as different education levels ($p < 0.001$) (Table 2).

Lastly, results of the Pearson correlation coefficient indicated a significant small positive relationship between annual spending on tobacco and willingness to pay ($r = 0.19$, $p < 0.001$), significant medium positive relationship between spending on health due to tobacco consumption and willingness to pay ($r = 0.331$, $p < 0.001$) and significant medium positive relationship between annual income and willingness to pay, ($r = 0.341$, $p < 0.001$), while a non-significant small positive relationship was observed between age of initiation and willingness to pay ($r = 0.003$, $p = 0.95$) (Table 3, *Supplementary Figures 10-13*).

Discussion

Considering the high prevalence of tobacco use, the study assessed the median willingness to pay for an effective tobacco cessation strategy amongst tobacco users in the state of Rajasthan, India, known for its early age of tobacco initiation and high prevalence. The present study aligns with previous research indicating a high willingness to quit among tobacco users in India and addresses the significant gap between intent and action. By drawing on the economic principle of commitment and consistency, the study introduces the concept of financial endowment through willingness to pay (WTP) as a potential motivational tool for tobacco cessation. This approach finds resonance with the World Health Organization's emphasis on providing support for quitting as a crucial intervention (World Health Organization, 2019) [17].

The application of the contingent valuation method (CVM) to assess WTP for a tobacco cessation service in the state of Rajasthan adds a novel dimension to existing literature. A substantial number were willing to pay for a cessation tool, emphasizing the perceived value of such a service. Our findings resonate with studies employing similar methodologies to assess WTP for health-related services (Steigenberger et al., 2022; Wolff et al., 2020) [18,19]. The observed WTP values and their variations across demographic categories underline the importance of tailoring interventions to specific population segments, as emphasized by earlier studies on tobacco cessation interventions (Hollis et al., 2007 and Onwuzo et al., 2024) [20,21].

The global burden of tobacco consumption on mortality and morbidity is well-established, with over a million annual deaths in India (Jain et al, 2023) [22]. Despite the alarming prevalence of tobacco use in India, studies consistently report a substantial willingness to quit [3-5], contrasting sharply with the low actual quitting rates, standing at less than 20% (Global Adult Tobacco Survey, 2016-17 and Goyal et al., 2023) [3,23]. The present study findings are in harmony with the previous studies and report a 60.7% willingness to quit amongst current tobacco users of Rajasthan. The slightly higher value of the willingness may be due to the landmark initiatives in the Rajasthan state towards tobacco control associated with increased awareness amongst tobacco users (WHO, 2019) [24].

Individual estimations of willingness to pay based on participant characteristics revealed notable distinctions amongst males and married individuals. Such findings are similar to other WTP studies conducted in Indian contexts (Hadaye and Thampi, 2018) as well as in other LMICs (Onwujekwe et al, 2010) and may be explained largely due to the factors of financial freedom and association of gender with financial responsibilities in households in such scenarios. However, factors such as child bearing were seen to be associated with reduced willingness to pay, which may be linked to lesser purchase parity in low-income households (Conger et al, 2010) [25-27]. Furthermore, a higher WTP observed amongst the participants between age 26 and 35 years emphasises the awareness of tobacco related risks amongst the youth along with greater success potential for early life interventions (Suls et al, 2012) [28]. Similarly, comparisons with existing literature reveal consistent patterns. The findings echo the positive correlation between annual spending on tobacco and WTP (Levinson et al., 2004) [29]. Additionally, the observed positive correlation between spending on health due to tobacco consumption and WTP aligns with studies highlighting the economic burden of tobacco-related health issues (Xu et al., 2016; Öberg et al., 2011) [30,31]. The significant medium positive relationship between annual income and WTP is also consistent with research emphasizing the role of socioeconomic factors in health-related decision-making (Ali

et al., 2020) [32]. These findings highlight the economic considerations and financial investments individuals associate with their tobacco use, emphasizing the potential effectiveness of introducing financial commitment as a motivational tool for quitting.

Higher willingness to pay values amongst smokers in contrast to smokeless tobacco users also show the success of “No Smoking” campaigns and emphasise the urgent need to expand the horizons such initiatives to cater to other forms of tobacco such as bidi and smokeless tobacco. The paper attempted to assess the fee an individual tobacco user would pay for course of cessation treatment. Considering that the government already bears a cost of USD 69.96 (INR 5170.04) per successful quitter under the existing NTCP framework (Kumar and Saroj, 2020) [33], our study findings may provide a pathway for reorientation of the cessation services considering a nominal payment from the individuals willing to quit. The stated fee for cessation may thus be utilised for expansion of the grass-root level NTCP initiatives, ASHA incentivisation for successful referral and setting up of tobacco cessation units at Primary Health Care levels while ensuring user participation through commitment to reduce drop-outs from otherwise free services.

Nevertheless, our study acknowledges limitations, such as potential response bias in self-reported willingness to pay and the need for further longitudinal research to assess the sustainability of the financial commitment approach. There also exists the limitation of non-affordability amongst those willing to quit yet unable to pay for cessation, which underscores a provision of subsidies during the reorientation of cessation framework based on the commitment and consistency approach. Besides, the strength of our study lies in stating the positive association between willingness-to-pay values with household expenditure on tobacco products, healthcare costs incurred by an individual and their annual incomes. These findings, along with age-group specific WTP values can be used as a basis for developing tailor-made interventions targeting different population subsets and improve their efficacy.

Conclusions

The study's findings emphasise the critical importance of early age interventions in addressing tobacco cessation. As people go through life stages marked by greater financial and family responsibilities, their readiness to allocate finances on health benefits like tobacco cessation services tends to decline. Within this context, the phrase “catch them young” assumes a great deal of significance as a strategy for intervention. This study also provides landmark findings that specify at what targeted age-groups they transit into dependent roles thus effectively capturing peoples’ willingness and commitment towards health initiatives.

Lastly, the findings contribute to the growing body of evidence supporting innovative approaches to enhance tobacco cessation efforts by highlights the potential efficacy of incorporating financial commitment elements into cessation programs. By intertwining financial incentives or commitments with cessation efforts, policymakers can potentially bolster individuals' resolve to quit smoking, aligning with broader global initiatives aimed at mitigating the public health impact of tobacco.

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Online supplementary material:

Supplementary Figure 1. Flowchart showing sampling strategy in the multiphase cluster sampling design.

Supplementary Figure 2. Q-Q Plot depicting the non-parametric nature of the observed values for willingness to pay (in USD) amongst the study participants.

Supplementary Figure 3. Median and IQR WTP values for male and female study participants (in USD).

Supplementary Figure 4. Median and IQR WTP values for different age groups (in USD).

Supplementary Figure 5. Median and IQR WTP values for married and single/separated study participants (in USD).

Supplementary Figure 6. Median and IQR WTP values for study participants with and without children (in USD).

Supplementary Figure 7. Median and IQR WTP values for study participants of different income groups (in USD).

Supplementary Figure 8. Median and IQR WTP values for study participants based on educational levels (in USD).

Supplementary Figure 9. Median and IQR WTP values amongst participants consuming different forms of tobacco (in USD).

Supplementary Figure 10. Scatter plot showing correlation between WTP values and amount spent for Health Issues due to Tobacco Consumption (in USD).

Supplementary Figure 11. Scatter plot showing correlation between WTP values and Annual Income (in USD).

Supplementary Figure 13. Scatter plot showing correlation between WTP values (in USD) and age of initiation of tobacco consumption.

Table 1. Demographic characteristics of the study participants.

| Variable | Number (total=360) | Percentage |
|--|---------------------------|-------------------|
| Gender | | |
| Males | 208 | 57.78 |
| Females | 152 | 42.22 |
| Age | | |
| <25 years | 29 | 8.06 |
| 26-35 years | 145 | 40.28 |
| 36-45 years | 84 | 23.33 |
| 46-55 years | 54 | 15.00 |
| 56-65 years | 48 | 13.33 |
| Marital status | | |
| Single/Separated | 63 | 17.50 |
| Married | 297 | 82.50 |
| Children | | |
| Yes | 237 | 65.83 |
| No | 123 | 34.10 |
| Annual income (in USD, eq. to mid-year INR)^a | | |
| >20,000 | 37 | 10.28 |
| 10,000-20,000 | 73 | 20.28 |
| 7500-10,000 | 85 | 23.61 |
| 5000-7500 | 62 | 17.22 |
| 3000-5000 | 72 | 20.00 |
| 1000-3000 | 25 | 6.94 |
| <1000 | 6 | 1.67 |
| Educational level | | |
| Secondary school and below | 123 | 34.17 |
| Graduate | 146 | 40.56 |
| Post graduate | 91 | 25.28 |
| Type of tobacco use | | |
| Exclusive smokers | 173 | 48.06 |
| Exclusive SLT use | 135 | 37.50 |
| Smoked and smokeless use | 52 | 14.44 |
| Willingness to quit and pay for cessation | | |
| Unwilling to quit | 143 | 39.72 |
| Willing to quit, unwilling to pay for cessation | 34 | 9.44 |
| Willing to quit and willing to pay for cessation | 183 | 50.83 |

^a1 USD equivalent to INR 73.9 (mid-year exchange rate for 2021).

Table 2. Median willingness to pay for tobacco cessation with IQR values for different demographic characteristics amongst the study population.

| Variable | Median (USD) | WTP | IQR | p-value |
|--|--------------|-----|--------------|--------------------|
| Gender | | | | |
| Males | 54.05 | | 24.32-108.11 | 0.002 ^a |
| Females | 24.32 | | 14.19-121.62 | |
| Age | | | | |
| <25 years | 21.62 | | 8.11-74.32 | 0.001 ^b |
| 26-35 years | 54.05 | | 27.03-175.68 | |
| 36-45 years | 24.32 | | 8.11-121.62 | |
| 46-55 years | 27.03 | | 24.32-94.59 | |
| 56-65 years | 17.57 | | 5.41-40.54 | |
| Educational level | | | | |
| Undergraduate | 18.92 | | 8.11-40.54 | 0.001 ^b |
| Graduate | 53.38 | | 27.03-108.11 | |
| Post-graduate | 81.08 | | 27.03-216.22 | |
| Annual Income (in USD, eq. to mid-year INR)^c | | | | |
| >20,000 | 121.62 | | 67.57-270.27 | 0.001 ^b |
| 10,000-20,000 | 54.05 | | 40.54-135.14 | |
| 7500-10,000 | 32.43 | | 24.32-135.14 | |
| 5000-7500 | 27.03 | | 18.92-108.11 | |
| 3000-5000 | 27.03 | | 8.11-81.08 | |
| 1000-3000 | 16.22 | | 8.11-24.32 | |
| <1000 | 10.82 | | 5.41-16.22 | |

^aStatistical significance as obtained from Mann-Whitney U Test; ^bStatistical significance as obtained from Kruskal-Wallis H test; ^c1 USD equivalent to INR 73.9 (mid-year exchange rate for 2021).

Table 3. Correlation between willingness to pay for tobacco cessation values and characteristics of the study population.

| Variable | Median (IQR) | Correlation coefficient | p |
|-----------------------------------|--------------------------------|-------------------------|--------|
| Annual spending on tobacco (USD) | 243.24 (145.95-486.49) | 0.19 | 0.001* |
| Annual spending on health** (USD) | 6.76 (20.27-36.04) | 0.33 | 0.001* |
| Annual Income (USD) | 12,162.16 (6,756.76-24,326.32) | 0.34 | 0.001* |
| Age of Initiation (years) | 20 (16-22) | 0.003 | 0.95 |

*Statistically significant association; **Annual spending on health for conditions perceived attributable to tobacco use.