

# IMPROVING NUTRITION FOR BANGLADESH



RESEARCH PAPER



## **TOBACCO CESSATION:** COSTS AND BENEFITS OF SMOKELESS TOBACCO CESSATION DURING PREGNANCY IN BANGLADESH

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**M. ENAMUL HOQUE**  
UNIVERSITY OF QUEENSLAND, BRISBANE



# Tobacco Cessation: Costs and Benefits of Smokeless Tobacco Cessation during Pregnancy in Bangladesh

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Bangladesh Nutrition

**M. Enamul Hoque**

*University of Queensland, Brisbane*

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[info@copenhagenconsensus.com](mailto:info@copenhagenconsensus.com)

[www.copenhagenconsensus.com](http://www.copenhagenconsensus.com)

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## Background

The tobacco epidemic is a leading danger to global health. Nearly six million people die each year as a consequence of tobacco use (1). Tobacco exposure is the single greatest preventable cause of morbidity, disability and mortality (2, 3). Smoking is the most common way of consuming tobacco, and tobacco is the most commonly known substance smoked. However, tobacco can be consumed both in smoke and smokeless form. Smokeless tobacco (SLT) is known as chewing tobacco or oral tobacco, including a large variety of commercially available products and mixtures that contain tobacco as the principal constituent and are used either orally or nasally without combustion (4-6). SLT is also known as 'Shadapata' in Bangladesh (6). It refers to a form of chewing tobacco furnished into long strands of whole leaves and consumed by placing a portion of the tobacco between the cheek and gum or teeth and chewing (6).

More than one third of total tobacco consumption in South Asia is in the form of smokeless tobacco (5, 7). SLT is common among men and women in South Asian and South and Western Pacific Island countries (1, 4, 6, 8, 9). The World Health Organization (WHO) estimates that there are nearly 250 million adult smokeless tobacco users in South East Asia (including 26 million in Bangladesh) representing 90% of global smokeless tobacco consumers (1).

In Bangladesh there are more than 25 million SLT user (1). Men are the main tobacco smokers in Bangladesh, whereas both men and women consume smokeless tobacco (1). Compared to men, the prevalence of smoking among women (1.5%) is very low in Bangladesh (44.7%). Among women, prevalence of current tobacco consumption, both smoking and smokeless, is 28.7% (1) and the prevalence of SLT consumption among women is 27.9% (1). Bangladesh has the highest prevalence of SLT among women in the world. In South Asia, traditional values and social norms do not favour smoking by the young or by women, but there is no such taboo against SLT (4). SLT is a cultural practice of various South Asian peoples, including Bangladeshis (4, 10). SLT is integral to South Asian culture (6), being incorporated in traditional values, spirituality, beliefs, festivals, lifestyle, and rituals such as marriage and popular entertainment (4, 10). Its perceived medical value for curing toothaches, headaches and stomach aches leads many adults to become users. Some parents even encourage their children to use smokeless tobacco (4). Curiosity, peer pressure, and offers by friends and acquaintances contribute to initiation of use (10, 11).

## Forms of smokeless tobacco

There are various forms of smokeless tobacco, such as betel quid, zarda, gutka, paan masala, paan parag, tobacco with lime, tobacco with areca nut, tobacco tooth powder (gul), and dried tobacco leaves. A commercial mixture of tobacco, lime and spices is known as zarda which is typically flavored with cardamom and saffron and often chewed in betel quid, and is popular in north India, Pakistan and Bangladesh (4, 12, 13). In Bangladesh, commonly used smokeless tobaccos are Shada, zarda and Gul. These are usually taken with betel quid, areca nut and lime. The use of smokeless tobacco mixed with areca nut is very popular in South and South-East Asia (4, 14).

## Health consequences of SLT consumption:

A number of studies indicate that SLT is a major risk factor for cancers of the oral cavity, throat, head, and neck (4, 15, 16). It also increases the risk of pancreatic cancer, diabetes, metabolic disease, cardiovascular disease, stroke, high cholesterol, and adverse pregnancy outcomes (2, 5, 17). Tobacco contains thousands of compounds that may have adverse effects on the human body. Nicotine is the major compound of significance. Nicotine is metabolized to many different compounds, the most notable being cotinine. Nicotine and its active metabolite cotinine increases maternal blood pressure and heart rate. Foetal heart rate is also increased and there is concomitant reduction in blood flow in the uterine artery and umbilical artery (5, 18, 19). Nicotine also impairs placental transfer of amino acids and affects foetal brain development which may cause foetal hypoxia and growth retardation (18, 19).

## Rationale for conducting benefit cost ratio of SLT during pregnancy

Although Bangladesh has made great achievements in maternal and child health improvement, adverse pregnancy outcomes remain a major public health issue in the country. The search for preventable causes and related health and economic benefits due to projects aiming to reduce such adverse pregnancy outcomes is of the utmost importance.

Despite the high prevalence of SLT consumption and widespread recognition of the importance of adverse pregnancy outcomes, the scientific community has paid relatively little attention to its effects on pregnancy outcomes and health and economic benefits through smokeless cessation interventions during pregnancy. As a consequence, little is known about the economic benefit of tobacco cessation program during pregnancy in the Asia-Pacific region, especially in Bangladesh. As no such known intervention has been pursued in Bangladesh, it is worthy to undertake cost benefit analysis to understand the economic benefit of such an intervention.



As women in Bangladesh consume SLT in general (1), it is important to make an attempt to initiate a SLT cessation program during pregnancy rather than investing money for cessation program on both smoking and SLT for pregnant women. Consuming SLT during pregnancy may contribute to low birth weights and still births (20). It is essential to pursue tobacco cessation during pregnancy, as behavioural intervention can assist women in stopping consumption of tobacco during pregnancy (21). The findings have important implications for introducing new public health interventions in this area.

## Methods

The cost and benefit data of the intervention were extracted from reviewed documents. As no such intervention has taken place in Bangladesh before, and the information related to SLT cessation program is rare in the literature, a simulation method was used to measure the benefit of such an intervention. As the target group of the intervention are pregnant women, demographic analysis was conducted to measure the total number of pregnant women in the country in 2015.

### Demographic analysis

According to a 2011 census, 49% of the total population of Bangladesh are women (22). The total population in 2015 was estimated at 160,300,000 million. Assuming that the male to female ratio in 2011 continues until 2015, the total number of women in Bangladesh in 2015 was estimated to be 78,547,000 million. The Bangladesh Demographic and Health Survey (BDHS) 2014 reported that the birth rate was 22.2 per 1000 people (23). The 2011 census also reported that 78.6% of the female reproductive age (15- 49 years) were married and among these married women, 6.1% were pregnant. Considering the aforementioned information, the total number of pregnant women in 2015 was calculated as 3,766,014 million.

The prevalence of SLT consumption among women is 27.9%. There is no such information on the prevalence of SLT consumption among pregnant women in Bangladesh. However, we assumed that all women who consumed SLT before pregnancy also continue the consumption of SLT during pregnancy as well. One may argue that the population of pregnant women in Bangladesh is younger than the average age and as a result, probably consume less SLT. Thus, the prevalence of SLT consumption among pregnant women should be lower than the prevalence of SLT consumption among women. On the other hand, Rahman et al (2012) mentioned that sometimes older members of the family, such as mothers and mothers-in-law advise pregnant women to consume SLT with betel leaf as a means to relieve morning sickness. Thus, the prevalence of SLT consumption among

pregnant women might be higher than the prevalence of SLT consumption among women. Keeping both scenarios in mind, it can be assumed that the prevalence of SLT consumption among pregnant women is equal to the prevalence of SLT consumption among women.

## Cost data

The goal of the smoking cessation intervention during pregnancy is to change the behaviour of pregnant women to stop consuming SLT during pregnancy. Most tobacco cessation intervention studies come from developed countries and focus on cigarette smoking. In the case of the smokeless tobacco cessation program, the behavioural intervention is assumed to be best for Bangladesh, as a pharmacological intervention for quitting smokeless tobacco is not widely available. The behavioural intervention includes face to face counselling by a health care provider and printed materials. However, the cost for smokeless tobacco cessation intervention during pregnancy is not available in the literature. Consequently, for the costing data, the best possible information would be information from maternal health programs. The cost of behavioural change and communication related to maternal health programs in Bangladesh is available from Sarker BK et al (24). The behavioural intervention will be run by community health workers who visit the household in the community to deliver several behavioural change and communication (BCC) messages. When the pregnant women first meet the health care provider or community health workers to receive the ANC, the women will be asked if they consume SLT. Thus, determining whether the pregnant women consume SLT could be done free of cost. The cost item relating to the SLT cessation intervention is considered based on three different channels - face to face counselling (FFC), group counselling (GC) and mass media (MM). Community health workers provide FFC to the pregnant women and their family during their regular field visits. Along with maternal and child health services, the FFC will include SLT cessation messages. The GC is expected to be conducted bimonthly in the community. Thus, pregnant women are supposed to have the chance to attend such meetings four times during their pregnancy. During this meeting, the messages related to SLT cessation will be provided. The MM channel includes four sub channels – folk song performance, street drama, TV spots and billboards. The BCC messages will be provided through artist singing folk songs and performing dramas in public places at least once in a year. A one minute TV spot will be broadcasted to the community through video channels of local cable networks, at least 10 times a day. The billboards for the program will be set up in highly visible areas beside major streets or in public places such as markets. Details of the intervention will be provided elsewhere (24).

All cost data in this paper was reported as costs in 2011 and the total cost per person for these three items was \$2.25 in 2011. Converting dollars into taka and then using the consumer price index and

after converting Taka back to US dollar, this costing data was converted in 2015 values (25). Using the CPI (25), the total cost per person was \$2.88 in 2015. Table 1 provides the unit cost per BCC item during pregnancy in US\$.

Table 1. Unit cost per BCC item in US\$

Intervention	Unit cost in 2011 <sup>^</sup>	Unit cost in 2015 <sup>*</sup>
Face to face counselling	0.82	1.05
Group counselling	0.82	1.05
Mass media	0.61	0.78
Total	2.25	2.88

<sup>^</sup> Source: Sarker et al (2013); <sup>\*</sup> converted into 2015 using CPI and exchange rate

## Benefit data

### *Identification of co-morbidities*

A literature search was carried out to identify co-morbidities of smokeless tobacco consumption, especially during pregnancy. Studies from various countries indicate that SLT consumption is a risk factor for adverse pregnancy outcomes (20, 26, 27). Adverse pregnancy outcomes associated with SLT consumption during pregnancy includes low birth weight due to preterm birth, and intrauterine growth restriction, congenital anomalies, spontaneous abortion, and stillbirth (5, 20, 26, 28). SLT consumption during pregnancy is also associated with infertility, menstrual problems, osteoporosis and early menopause (7).

### *Estimating the risk factor attributable burden*

To allocate the proportion of the total costs of the diseases attributable to SLT consumption, the population attributable fraction (PAF) was used (29). This was calculated using the formula:

$$PAF = P \times (RR-1) / [P \times (RR-1) + 1],$$

Where P is the probability of a pregnant women using SLT in a given population and RR is the relative risk for the disease of the pregnant women consuming SLT, the relative risk for still birth due to SLT consumption, which is 2.87, was obtained from Hossain S et al, 2015 (30). In contrast, the relative risk for LBW due to SLT consumption, which is 3.3, was obtained from Hossain MM, 2014 (31).

The prevalence of still births in Bangladesh in 2015 was 25.4 per 1000 live births and was collected from Blencowe H et al, 2016 (32). The prevalence of LBW, 13.2%, was acquired from the Bangladesh Demographic and Health Survey (BDHS), 2014 (23). The LBW was collected from the BDHS based on mother's estimates of baby size at birth.

## Benefit analysis

There are two broad classes of benefits attributed to pregnant women from a cessation of smokeless tobacco. Firstly, the reduced possibility of giving birth to a low birth weight baby. Secondly, there will be a smaller chance of a still birth during delivery. Based on the information that 7.5% of income loss occurs due to LBW (33), it was assumed that if the intervention is implemented, then 7.5% of extra income per person will be added to the economy. While measuring the benefit related to still births was considered, it is assumed that if the infant is saved in 2016, then s/he will enter the labour market at age 18 in 2034. Considering the retirement age is 60 in Bangladesh, this person will be in the labour market until 2076. As a result, this person will contribute to GDP from 2034 to 2076. A trend analysis of the wage per capita; i.e. output per worker of Bangladesh, was conducted to get the wage per capita during 2034 to 2076 in Bangladesh. The output per worker was calculated considering 54% of dependency rate and 65% of the working age people in the country. After considering the discount rate and summing up the total contribution of the person in GDP during this period, the total benefit of SLT cessation during pregnancy per person was measured. Finally, economic gain due to reducing still births and LBW was calculated using different discounting values (3%, 5% and 10%).

Regarding the effectiveness of the intervention, one must consider that smoking is very addictive and difficult to quit within a short period of time. However, if the proper message can be given to pregnant women related to LBW and still births as a result of SLT consumption during pregnancy, the effectiveness is assumed to be high. Based on the assumption made by Marks JS et al (34) of a 15% efficacy rate of a typical smoking cessation program, it is also assumed that 15% of the benefits are realised from SLT cessation during pregnancy. A worst case scenario of 10% efficacy and best practice scenario of 25% efficacy rate are assumed for the analysis.

## Benefit cost ratio analysis

Cost-benefit analysis is a method of economic evaluation that answers whether the costs of an intervention can be justified by the value of the benefits it provides. To estimate the costs and benefits of smoking cessation programs across the country, the total annual costs and benefits were

first measured and then translated into a benefit cost ratio of smokeless tobacco cessation per pregnant woman. Finally, considering 15% of the benefit are realised, benefit cost ratio was calculated to 13.8, 7 and 1.9 at 3%, 5% and 10% discounting values respectively. It means that every dollar invested into SLT cessation through BCC during pregnancy is estimated to generate \$7 in economic returns, using a 5% discount rate.

## Sensitivity analysis

A sensitivity analysis was carried out using different discount rates in measuring the benefit as the economic returns are explicit about the rate used. Table 2 provides a sensitivity analysis, showing the benefit cost estimates under the different estimates of effectiveness of the tobacco cessation intervention during pregnancy and discount rate.

Table 2: A sensitivity analysis of benefit cost ratio estimates to assume the impact of the smokeless tobacco cessation intervention during pregnancy and different discount rate

Effectiveness of the intervention (%)	Discount rate		
	3%	5%	10%
10%	9.2	4.7	1.3
15%	13.8	7.0	1.9
25%	23.0	11.7	3.2

The sensitivity analysis indicates that the benefit cost ratio of the tobacco cessation program during pregnancy in Bangladesh can range from 1.3 to 23 based on the different discount rate and the effectiveness of the intervention.

## Discussion

The objective of this study is to determine whether the cost of adopting a smokeless tobacco cessation program during pregnancy in Bangladesh could be justified by the benefits. Accordingly, we adopt a cost-benefit analysis framework and estimate the costs and benefits of behavioural programs. The current paper has outlined the economic rationale for investing in a SLT cessation program during pregnancy in Bangladesh. The overall goal of the paper was to create credible estimates of benefit cost ratio for such an intervention.

The study has several potential limitations. The cost of the intervention to measure the benefit cost ratio here has been collected from an intervention which was targeted for raising maternal health

awareness. The real cost of a smoking cessation intervention during pregnancy could be different, and thus, a different benefit cost ratio might emerge. However, based on the higher benefit cost ratio of the current analysis, it can be assumed that the benefit cost ratio in a changes scenario will be positive. Again, no confidence interval has been provided for the cost data used for this analysis. In fact, the cost data extracted from the source, i.e. Sarker et al (2013) failed to report the confidence interval of cost data due to the qualitative nature of the cost data collection method. In addition, the cost data was collected from a provider perspective and thus, the cost incurred by households or individuals receiving BCC, such as time spent group counselling at health care facilities, was not included in the analysis. If the societal cost was included, the cost of the intervention would be higher and in turn, would lead to a lower benefit cost ratio.

Since the benefit calculation carried out in this paper has not taken into account the health impact on pregnant mothers due to second hand smoking, even the higher benefit cost ratio obtained from this analysis seems to be lower than the real figure. However, based on the analysis of the available evidence, the investment made for smoking cessation during pregnancy can be judged to be highly productive. As the benefit cost ratio shows a positive impact on the economy, the policy maker and health program managers should consider a health intervention program targeting SLT cessation during pregnancy in Bangladesh.

The findings of this study have implications for evidence-based public health interventions to prevent and manage the tobacco cessation during pregnancy. This will also help the policy makers of Bangladesh to introduce national policies for prevention and to control the use of SLT during pregnancy. The findings of the study will also guide the health-financing decision makers, development partners and donors in financing and allocating resources for reducing SLT use during pregnancy in Bangladesh and in other countries of the Indian subcontinent.

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