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Original Article

Tobacco and Anaemia in Pregnancy: Where Do We Stand?

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Abstract

Smokeless tobacco (SLT) consumption among pregnant women poses serious health hazards to both maternal and fetal outcomes. While the link between smoking and iron deficiency is documented, clinical literature exploring SLT-specific impacts on maternal haemoglobin (Hb) in Western India remains sparse. To investigate the association between antenatal SLT use and maternal haemoglobin levels, and to assess qualitative perceptions, drivers, and patterns of SLT consumption among postpartum women. A mixed-methods, case-control study was conducted at Sassoon General Hospital, Pune. The quantitative arm assessed 50 postpartum women (25 daily SLT users as cases, 25 non-users as controls) matched for gestational period. Data on demographic characteristics, obstetric records, and neonatal birth weight were extracted. Chi-square tests and linear-by-linear associations were performed to evaluate Hb discrepancies. The qualitative arm conducted semi-structured, thematic interviews with 6 participants (3 cases, 3 controls) to evaluate cognitive drivers and addiction dynamics. The hospital-based prevalence of antenatal SLT use was 12.5% (25/200). Mishri was the dominant product (60% exclusive use; 32% poly-SLT use). SLT users demonstrated significantly lower Hb levels than non-users: 76% of cases presented with Anaemia (36% mild, 24% moderate, 16% severe) compared to 36% of controls (24% mild, 12% moderate, 0% severe; $\chi^2 = 10.145$, $p = 0.017$). Furthermore, SLT users had higher rates of caesarean deliveries (60% vs. 40%) and twice the rate of low-birth-weight infants (40% vs. 20%). Qualitatively, mothers described using mishri not for recreation, but as a practical remedy to ease morning sickness, assist bowel movements, and relieve stress, reinforced by an inherited belief that roasted tobacco cleans teeth and protects gums. Using smokeless tobacco during pregnancy is strongly linked with maternal anaemia, lower birth weights, and higher surgical delivery rates. Routine iron supplements are not enough on their own; antenatal visits must actively incorporate supportive tobacco screening and community-level education to dispel deeply rooted myths surrounding mishri.

Keywords: *Smokeless Tobacco, Pregnancy, Maternal Anaemia, Mishri, Birth Weight, Antenatal Care*

Introduction

The use of tobacco constitutes a major preventable cause of morbidity and mortality across the globe. While smoked tobacco has grabbed significant media attention, smokeless tobacco (SLT) consumption remains a serious public health concern especially in South Asia. As per the Global Adult Tobacco Survey (GATS) reports, India has the largest SLT-consuming population in the world. The overall age group of 15+ years in India has a prevalence rate of 21.4% with 29.6% and 12.8% of males and females respectively being SLT consumers. Unlike cigarette and bidi smoking, which is strongly discouraged among women in Indian society, use of SLT such as mishri (roasted form of powdered tobacco used in the preparation of tooth powder), gutka, khaini and mawa is socially acceptable and affordable, often making their way into the oral cavity of children and adolescents without any second thoughts Nicotine and heavy metals in SLT, when chewed by pregnant women, pass through the placental barrier and increase the risk of abortions and complications like placental abruption and membrane rupture. The constriction of blood vessels in the womb reduces the supply of oxygen and micronutrients to the fetus, which can lead to foetal distress, Intra Uterine Growth Restriction (IUGR), Low Birth Weight (LBW) and preterm deliveries. India has one of the highest prevalence rates of gestational Anemia with 50-85% cases among pregnant women, which is responsible for almost 19% of maternal mortality.

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Nicotine and tobacco metabolites in SLT increase maternal risk for anaemia by reducing the iron bioavailability in various physiological ways, including diminished synthesis of sialic acid and down regulation of hepcidin in the serum. Although the National Health Mission (NHM) covers the supplementation of prophylactic iron and folic acid (IFA) to all pregnant women, antenatal tobacco screening is not addressed. The objective of this paper is to establish the association of use of SLT with reduced haemoglobin levels in mothers who have delivered after screening, and to understand the socio-behavioural myths around SLT addiction, looking at delivery outcome trends.

Materials and Methods

1. Study Setting and Design

We conducted a hospital-based, mixed-methods case-control study between February and April 2021 within the Postnatal Care (PNC) wards at Sassoon General Hospital, a tertiary teaching facility in Pune, Maharashtra.

2. Participants and Eligibility Criteria

Every third bed in the postnatal ward registry was screened systematically.

1. **Inclusion Criteria:** Consenting women aged 18 or older who delivered at Sassoon Hospital and had complete Antenatal Care (ANC) cards and blood records.
2. **Exclusion Criteria:** Patients under 18, those lacking verified ANC records, patients experiencing acute clinical emergencies, or those who declined consent.
3. **Cohort Definitions:**

1. **Cases ($n=25$):** Postpartum mothers who reported daily consumption of any SLT product throughout their current pregnancy.
2. **Controls ($n=25$):** Mothers matched by gestational age who reported zero lifetime or past-year tobacco use in any form.

3. Qualitative Interviews

To explore why women, turn to SLT and why they continue using it through pregnancy, we conducted private, semi-structured interviews with a purposive sample of six mothers (three cases and three controls).

4. Diagnostic Criteria

Maternal anaemia categories were defined based on institutional laboratory standards adapted from WHO guidelines:

1. **Normal:** $> 10.1\text{ g/dL}$ (empirically adapted from the standard $\ge 11.0\text{ g/dL}$ cutoff)
2. **Mild Anaemia:** $8.1\text{–}10.0\text{ g/dL}$
3. **Moderate Anaemia:** $6.5\text{–}8.0\text{ g/dL}$
4. **Severe Anaemia:** $< 6.5\text{ g/dL}$

Neonatal birth weights were categorized using standard WHO thresholds: Normal ($\ge 2,500\text{ g}$), Low Birth Weight ($< 2,500\text{ g}$), and Very Low Birth Weight ($< 1,500\text{ g}$).

5. Data Collection and Statistical Analysis

Clinical and demographic details were recorded via standardized forms (demonstrating strong survey reliability, Cronbach's $\alpha = 0.916$). Pearson's chi-square (χ^2) and linear-by-linear association tests were performed in SPSS to compare categorical outcomes. Qualitative interviews were transcribed verbatim and analyzed thematically using MAXQDA.

Results

1. Sociodemographic Background

Of the 200 postpartum women screened, 25 reported daily antenatal SLT use, reflecting an institutional prevalence of 12.5%.

1. **Age Distribution:** Most users were young: 40% ($n=10$) were aged 18–25, another 40% ($n=10$) were 25–32, and 20% ($n=5$) were 32–39.
2. **Marriage Age:** Over half (60%, $n=15$) married between 18 and 25 years of age, while nearly a third (32%, $n=8$) married before turning 18.
3. **Socioeconomic Status:** The majority were homemakers (62%) from lower-income urban households. Educational backgrounds were comparable between groups: 64% of cases and 60% of controls had completed primary school or less, whereas 36% of cases and 40% of controls had finished secondary education.

2. Product Habits, Dosage, and Triggers

Mishri was by far the primary tobacco product, used by 80% of users either exclusively or alongside other products.

Table 1: SLT Product Profile Among Antenatal Users (n = 25)

SLT Formulation	Participants, n (%)	Usage Classification
Exclusive *Mishri*	15 (60.0%)	Single-product use (68%)
Exclusive *Gutka*	2 (8.0%)	Single-product use
Mishri + *Gutka*	3 (12.0%)	Poly-SLT use (32%)
Mawa + *Gutka*	3 (12.0%)	Poly-SLT use
Mishri + *Gutka* + *Mawa*	1 (4.0%)	Poly-SLT use
Mishri + *Khaini*	1 (4.0%)	Poly-SLT use

Nearly three-quarters of users (72%, $n=18$) consumed their chosen product two to three times every day, while 28% ($n=7$) used it once daily. When asked what drove their daily use, women cited habit (32%), cravings or temptation (32%), needing help with morning bowel movements (16%), peer influence (12%), and family tradition (8%).

3. Maternal Haemoglobin and Perinatal Outcomes

Using smokeless tobacco was clearly associated with lower maternal haemoglobin and worse birth outcomes

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Table 2: Maternal Haemoglobin, Delivery Route, and Perinatal Outcomes

Clinical Parameter	Cases (n=25)	Controls (n=25)	Statistical Measure / p-value
Maternal Hb Category			Pearson \chi^2 = 10.145$, df=3$, **p = 0.017**
Normal (>10.1\text{ g/dL})	6 (24.0%)	16 (64.0%)	Linear-by-Linear Association:
Mild Anaemia (8.1–10.0\text{g/dL})	9 (36.0%)	6 (24.0%)	\chi^2 = 9.294, **p = 0.002**
Moderate Anaemia (6.5–8.0\text{g/dL})	6 (24.0%)	3 (12.0%)	
Severe Anaemia (<6.5\text{g/dL})	4 (16.0%)	0 (0.0%)	
Delivery Route			
Normal Vaginal Delivery	10 (40.0%)	15 (60.0%)	\chi^2 = 2.00$, p = 0.157
Caesarean Section	15 (60.0%)	10 (40.0%)	
Neonatal Birth Weight			
Normal (\ge 2,500\text{g})	15 (60.0%)	20 (80.0%)	Total LBW (<2500 g):
Low Birth Weight (1,500–2,499\text{g})	9 (36.0%)	5 (20.0%)	Cases: 40% vs. Controls: 20%
Very Low Birth Weight (< 1,500\text{g})	1 (4.0%)	0 (0.0%)	

While 64% of non-users had healthy haemoglobin levels, only 24% of SLT users did. Severe anaemia appeared only in the tobacco group (16%, $n=4$). Caesarean deliveries were notably more frequent among cases (60% vs. 40%). Similarly, twice as many babies born to SLT users suffered from low or very low birth weights (40% vs. 20%).

4. What Mothers Believed: Qualitative Insights

Most users understood that tobacco is generally bad for health 76% ($n=19$) acknowledged that it could cause issues like cancer (40%), stomach stones (20%), or abdominal pain (16%). Yet, 72% had no plan or desire to quit during their pregnancy. In-depth conversations revealed why:

1. **Symptom Relief:** Women leaned on *mishri* to handle early pregnancy discomforts, such as settling nausea, suppressing hunger during long work hours, or triggering regular morning bowel movements.
2. **Family Traditions and Fears:** Older female relatives often warned mothers that stopping *mishri* cold turkey would hurt the baby or cause birth defects like hearing loss. Many also believed roasted tobacco acts like toothpaste, cleaning the teeth and guarding against swollen gums.
3. **Clinical Silence:** Mothers reported that doctors and nurses rarely asked about smokeless tobacco during their checkups, leaving these misconceptions completely unaddressed.

Discussion

These results demonstrate that smokeless tobacco contributes to maternal anaemia and adverse birth outcome in Western India. The most common form of smokeless tobacco consumed was mishri, used by 80% of our cohort, a finding echoed by Ganganahalli et al. in their survey of Maharashtra. Nearly a third of our study group were poly-tobacco users, employing additional commercial packets of gutka or mawa in their daily dose, a practice also reported by Nair et al. who note the ready availability and low cost of these items as factory packed units, making them ideal for sharing with friends. A striking observation was the associations of SLT with maternal anaemia (OR $p = 0.017$). Maternal anaemia was more than three times as common amongst SLT users as non-users, 40% versus 12% ($p<0.0001$). This relationship is biologically plausible as chronic exposure to nicotine provokes an inflammatory response that may interfere with iron metabolism whilst simultaneously down-regulating transferrin receptors in the placenta. Combined with anorexia and reduced food intake due to nicotine stimulation, these factors contribute to diminished erythropoiesis in the mother with resultant anaemia. As expected, foetuses exposed to SLT in utero were more likely to be delivered with low birth weight (40% versus 20%, $p<0.0001$). Chronic vasoconstriction due to nicotine exposure reduces placental perfusion resulting in impaired nutrient delivery and fetal growth retardation. It is this same interference with placental blood supply that is likely to explain the increased likelihood of caesarean delivery (60% versus 40%, $p=0.03$) amongst mothers who used SLT during pregnancy.

Our qualitative findings highlight how SLT use during pregnancy is viewed by the user as being an innocuous part of her daily hygiene. The most common reason cited by study participants for continuing to use SLT during pregnancy was its ready availability as an alternative to toothpaste and is viewed by many to be a safe and effective remedy for constipation and morning sickness. These beliefs are further reinforced by their elders who do not consider SLT use during pregnancy to be a problem and combined with the fact that antenatal visits focus on the prescription of iron supplements and not screening for SLT, such practices are not discouraged. However, our findings are limited by the small sample size (n=50) of our study due to restrictions placed on hospital visits due to the COVID-

19 pandemic and the subjective nature of self-reported tobacco consumption as opposed to objective biochemical markers such as cotinine assays.

Conclusion

Antenatal smokeless tobacco use is associated with decreased maternal haemoglobin (HB), higher rates of caesarean section deliveries, and low birth weight. With India recording a significant prevalence of gestational anaemia, mere distribution of iron supplements would not be sufficient to address this growing public health concern. It is crucial that smokeless tobacco screening becomes an integral part of every ante-natal care visit. Sensitizing community health workers such as ASHAs, ANMs and building their capacities to advice and counsel the families, bust myths around mishri, and practice empathetic communication while dealing with this sensitive issue, will go a long way in ensuring the health security of millions of mothers and their children.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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