Smokeless tobacco consumption in South Asia: a review of the health programmes and interventions to reduce consumption

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ABSTRACT

Over 290 million smokeless tobacco (SLT) users are located in South Asia (SA), accounting for 80% of the global burden of disease. Consequences of consumption include oral cancer, ischemic heart disease and still births, leading to an increased morbidity and mortality. The lack of a global mandate has led to less regulation and greater affordability of smokeless tobacco products, causing smokers to switch to these products. The need to identify effective interventions to reduce smokeless tobacco consumption is evident. This review will appraise the effectiveness of health programmes and interventions used to reduce SLT consumption in SA and identify areas for future research. Literature was found by searching Global Health, Medline, Web of Science, Google Scholar and Pubmed, using key terms. Literature was then systematically assessed using inclusion and exclusion criteria to yield 19 pieces of literature for this review. Four broad intervention categories were identified and appraised using different criteria for effectiveness. Each intervention had varying levels of effectiveness which depended on external factors. The lack of literature evaluating SLT interventions was noted and feasibility was estimated where necessary. Although interventions had a high effectiveness in some areas, many demonstrated low effectiveness due to their complex multi-sectoral nature. Further research is required to identify effective strategies and barriers precluding implementation.

1. Introduction

Smokeless tobacco (SLT) is a type of tobacco used without combustion (Appiah et al., 2020; International & Agency for Research On Cancer, 2019; Sinha et al., 2012). It can be consumed orally by chewing or applying to gums, or nasally (Organisation, 2003). Gutka, chewing tobacco and snuff are just a few examples of SLT products, all containing numerous carcinogenic substances damaging to health. SLT consumption increases risk of chronic and terminal illnesses and is becoming an increasing global threat to health (World Health Organization, 2018).

SLT consumption increases risk of morbidity and mortality. The IARC classifies SLT as carcinogenic, with oral cancer being its main consequence as products are directly applied to the oral mucosa. SA has the highest global prevalence of oral cancer, resulting in high morbidity rates and disease burden (Siddiqi et al., 2020).

Finds increasing SLT consumption increases risk of cardiovascular diseases such as fatal ischemic heart disease (IHD) and stroke. SLT use during pregnancy is associated with low perinatal birth weight, preterm and still births, increasing risk of neonatal mortality, but many mothers are unaware

of these consequences. These fatalities highlight the need for early intervention and prevention to reduce the disease burden (Warnakulasuriya, 2018).

Over 290 million SLT users are located in South Asia (SA) accounting for 80% of the global disease burden. The WHO Framework Convention on Tobacco Control (FCTC) is an agreement seeking to reduce tobacco consumption in all signatory countries. As the FCTC focuses primarily on reducing smoking tobacco consumption and with no comparable global regulation for SLT, consumption is rising. Smokers are switching to SLT due to less regulation and greater affordability (Inamdar et al., 2015).

Determinants such as lower education and socio-economic status are associated with higher SLT usage. (Sinha et al., 2012) finds 42.3% of people with no education consume SLT, compared to 10.2% with secondary education, and 36.1% of the lowest wealth index consume SLT compared to only 17.3% of the wealthiest (Khan, Tonnies, et al., 2014). Furthermore, in SA women face less stigma using SLT compared to traditional smoking and SLT has a high cultural acceptability, increasing demand. These factors mean SLT users outnumber smokers in SA, demonstrating the need for equitable interventions to decrease prevalence (Marquez et al., 2018b).

The FCTC recommends price measures, such as taxation, and non-price measures, such as regulation of tobacco products, to reduce demand. However, these regulations focus on smoking tobacco as SLT is not mentioned in the FCTC report, and no global treaty has been set for SLT (Suliankatchi et al., 2017). Effective strategies and interventions need identifying in SA to curb the rise of SLT consumption and share effective solutions with the international community (Sugiyo & Henshall, 2020). SLT use is becoming an increasing global treat to health and the need for interventions to reduce consumption is vital (Siddiqi et al., 2013; Sinha et al., 2012).

1.1 Aim

This review will appraise the effectiveness of health programmes and interventions used to reduce SLT consumption in SA and identify areas for future research.

1.2 Objectives

- To identify health programmes and interventions used to reduce SLT consumption in SA.
- To analyse and explain what is known about the effectiveness of these health programmes and interventions.
- To identify gaps in the research and suggest areas for further research.

2. Methods

2.1. Search Strategy

The initial aim was to measure the effectiveness of strategies to reduce betel quid (BQ) consumption, a specific SLT product. However, after searching and reading the literature, conclusions were drawn that choosing BQ alone would be limiting. The literature and initial search also demonstrated that picking an individual country would not produce the quantity of papers needed, as SLT is under researched. The literature frequently mentions SA as one entity as it is this region that carries the greatest burden of SLT. Therefore, the aim was widened to include all forms of SLT in SA.

The literature search was carried out using the three following databases:

- Global Health (2012 to December 2021)
- Ovid MEDLINE(R) (2012 to December 2021)
- Web of Science Core Collection (2012 to December 2021)

The title was split into 3 broad search topics: SLT, health programmes and interventions and SA. Alternative search terms were found by looking at literature keywords and key terms (Huque & Sinha, 2017; Khan, 2015) . These search terms were then mapped to Medical Subject Headings (MeSH). The explode function and wildcards were used to maximise results. The 'OR' function was used between search terms and MeSH, and the 'AND' function was used between search topics. This produced 252 results from the 3 databases, a summary of which is seen in Table 1.

Table 1. List of Search Topic

Search Topic	Search Term	MeSH Key Term Mapping	Number of Results
Smokeless tobacco	Smokeless tobacco	Chewing tobacco Tobacco chewing	10182
	Betel quid	Betel Betel chewing Buai Arecanuts	
	G?utk?a	Paan Pan masala	
Health programmes and interventions	Health adj2 program*	Public health Health promotion Education health education Health services	10147664
	Intervention*		
	Polic*	Educational policy Health policy Regional policy Social policy	
South Asia	South Asia		174639
	Final Search		**252**

Search topics, corresponding terms and results

10 additional papers were identified through Google Scholar and PubMed, yielding 262 pieces of literature to be screened with established inclusion and exclusion criteria.

2.2. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria, found in Table 2, were first used to screen titles and abstracts, and later full text. This search process is summarised in Fig. 1, yielding 19 pieces of eligible literature (PRISMA, 2017).

Table 2. Inclusion and Exclusion Criteria

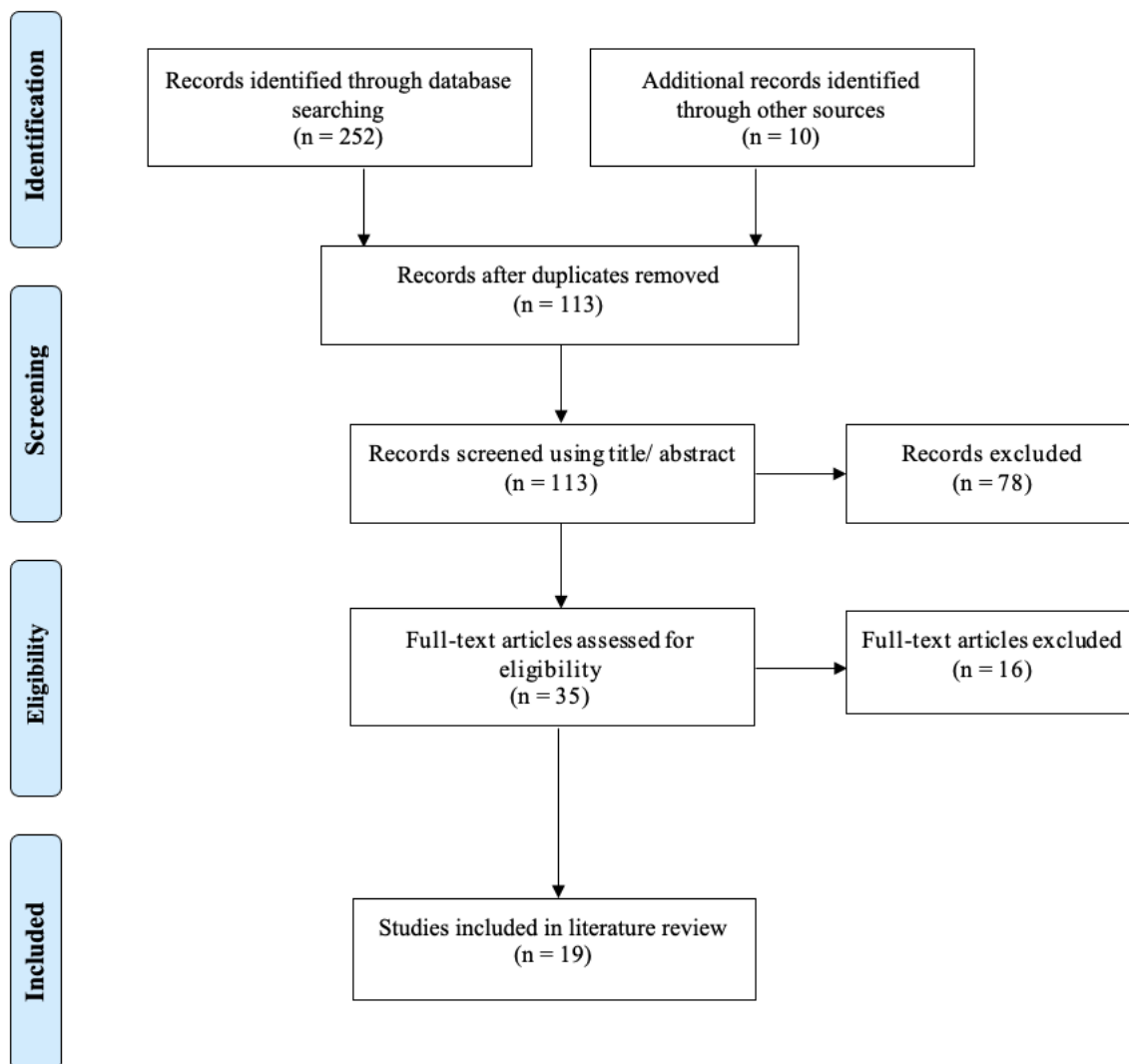| Inclusion Criteria	Exclusion Criteria
Studies focus on health programmes and interventions to reduce SLT consumption	Non-English language literature
Studies are carried out in SA	Full text not available
	Literature not solely focused on SLT or includes smoking

Inclusion and Exclusion Criteria

Fig. 1. Search strategy adapted from Prisma (2012)

2.3. Data Synthesis

Elements of data synthesis guidelines were used to systematically summarise the 19 pieces of literature, group them by strategy type and tabulate results. Table 3 displays the 4 strategy types and corresponding papers. Some papers reviewed more than one strategy type.

2.4. Search Limitations

Papers describing interventions to reduce consumption of both smoking and SLT were excluded as the review focused exclusively on SLT strategies, potentially dismissing useful combined interventions. Literature was also limited to those written in English, limiting the number of results as studies written in local languages may not have been translated.

3 papers were not accessible. Authors were emailed in an attempt to gain access, but no responses were received, another potential for missed studies.

Out of the 19 studies identified, only 3 (India, Bangladesh and Pakistan) out of the 8 South Asian countries were studied. Although literature describing general interventions in SA was used, no studies mentioned Sri Lanka, Bhutan and the Maldives, limiting the generalisability of this review

Finally, some papers mentioned alternative interventions such as nicotine replacement therapy and oral cancer screening. However, these were excluded as they were only mentioned in one paper, limiting the types of interventions discussed.

3. Results and Discussion

3.1. Appraising Effectiveness

Effectiveness is a broad term and is used to determine the success of strategies and interventions. Effectiveness can be subdivided into different domains and appraised respectively (Burches, 2020). I will be using (Walley & Wright, 2010). Public Health Intervention Strategy Option Appraisal Framework to describe and explain the effectiveness of health programmes and interventions (see Table 3), using criteria stated in Table 3.

Table 3. Assessment Criteria

Assessment Criteria	Definition
Technical Effectiveness	How successfully a strategy leads to SLT cessation
Sociocultural Acceptability	How acceptable the strategy is to the community
Organisational Feasibility	How easy a strategy is to implement
Financial Feasibility	How cost effective the strategy is

Assessment criteria with definitions to measure the overall effectiveness of a strategy, adapted from Walley and Wright (2010).

This framework comprehensively appraises strategies and interventions across all areas and is recommended when reviewing existing programmes (Walley & Wright, 2010).

3.2. Education

Education interventions aim to provoke cessation behaviour and can act on an individual or population level.

3.2.1 Technical Effectiveness

Increased interactions are reported by (Marquez et al., 2018a) and (Liddle & Pennick, 2015a) mass media campaigns (Tam et al., 2015) school-based Behaviour Changing Intervention (BCI) leads to increased SLT knowledge and intention to quit; and (Goeijenbier et al., 2014; Huque & Sinha, 2017; Ketsuwan et al., 2018) reports increased intention to quit after cessation helpline consultations. However, only (Liddle & Pennick, 2015b) and (Marquez et al., 2018b) records successful SLT cessation, with the other interventions only noting intention to quit. This questions the validity of the papers as it relies on the proxy of intention rather than the intended outcome of cessation.

Low technical effectiveness for the Sponge mass media campaign in Pakistan due to low respondent engagement (Karim et al., 2020). Additionally, low SLT knowledge by doctors, leading to an unsuccessful patient education intervention (Das et al., 2015). Correct population assessment and adequate staff training is required to increase these interventions' technical effectiveness.

Many education studies have recorded positive outcomes; however, as few have recorded successful cessation behaviours, further research is required to identify interventions causing cessation.

3.2.2 Sociocultural Acceptability

Education interventions can operate at an individual level. (Das et al., 2015) opportunistic intervention is deemed unsuccessful as doctors had low SLT knowledge but showed high potential as doctors are trusted and respected members of society. Beck et al (2014) and Ageely (2014) targets school children as SLT consumption typically begins in adolescence. These BCI were adapted and tailored by experts in South Asian culture, leading to high sociocultural acceptability. However, those who were unable to attend school such as young mothers did not have access to this strategy. Extra efforts in reaching vulnerable populations such as pregnant women need to be made, to increase acceptability.

Cessation helplines reported by (Huque & Sinha, 2017; Ketsuwan et al., 2018) operate at a population intervention level. Nethan et al. (2018) reports a quit rate of 20% amongst SLT users after 18 months of cessation helpline support and the mobile health cessation intervention in India had 1.6 million signups after their launch (WHO, 2018). 76% of the population in SA own a mobile phone and will consequently have access to these interventions. However, those in rural SA and women in SA are respectively 31% and 28% less likely to own a mobile phone, demonstrating how this

intervention may widen the inequality gap. Achieving intervention equity needs considering and should be included as an evaluation criterion in future frameworks (Winarsih et al., 2019).

3.2.3 Organisational Feasibility

The 2009 Surgeon SLT mass media campaign in India was government led, airing patient testimonials on television and radio. Surgeon campaign had a higher organisational feasibility in comparison to the Sponge campaign (private) as access to national media was easily secured, highlighting how governmental interventions can increase feasibility. Similarly, free national quit lines in India are easily implemented as they are government led (Hasan & Ageely, 2011; Ketsuwan et al., 2018), these cessation services are only implemented regionally and potential for national upscaling has not been assessed.

Adequate training of stakeholders is required to ensure a high organisational feasibility. Training of teachers for (Ageely, 2014) school BCI and training of doctors for opportunistic intervention is required to deliver SLT information and cessation advice to respective cohorts. Training delivery strategies would be highly feasible as school and hospital systems already exist.

Organisational feasibility of education strategies therefore depends on provision by either public or private sector and if existing delivery systems are in place or not.

3.2.4 Financial Feasibility

Determines the Surgeon mass media campaign as cost effective as it reduced premature mortality risk by 40% (Muthukrishnan & Warnakulasuriya, 2019). High quality study robustly calculated campaign costs, enhancing reliability of results. Similarly, Facebook campaign secured 840 interactions with minimal sponsorship costs to ensure a greater reach. However, the cost benefit of study is not recorded as they did not calculate cessation behaviours, thus decreasing reliability.

The financial feasibility of school BCI and education at health centres is unknown, as costs of training stakeholders has not been calculated (Cahil et al., 2010). reports a 33% decline in smokers in England, stating BCI as cost effective, however, results are not as transferable as they do not relate to SLT or SA. Therefore, SLT education financial feasibility in SA is unknown and further research is required to appraise this.

3.3. Taxation

Taxation has been implemented in SA, however, not as rigorously as it has been for smoking tobacco.

3.3.1 Technical Effectiveness

Taxation of tobacco products is the most consistently effective strategy for reducing consumption (Guyton & Hall, 2006) and it is recommended by the WHO FCTC under Article 6 (Singh et al., 2020). A study by (Joseph & Earland, 2019) finds a 10% rise in SLT price would decrease consumption by 5.8% and finds that a 4% cigarette tax rise leads to a decrease in 3 million smokers. Taxation demonstrates a high technical effectiveness based on the efficacy of smoking taxation, however, research into SLT taxation is scarce as there is a lack of uniformity in their price, packaging and production leading to varying tax measures (Karim et al., 2020; Huque et al., 2017). Further research should be undertaken to determine its effectiveness.

In India, although SLT products are taxed at the highest tax bracket, they still remain up to 5-fold cheaper than cigarettes (Singh et al., 2020). Between 2006-2009, taxation for cigarettes nearly doubled in India, whereas there was no change in SLT taxation (Khan et al., 2014). SLT research, taxation and policy measures are neglected in SA, despite their higher consumption than smoking (Khan et al., 2014). Although SLT taxation in SA is implemented, taxes are easily evaded and enforcement is weak (Karim et al., 2020).

3.3.2 Sociocultural Acceptability

58% SLT price rise in India leads to a 51% decline in consumption, demonstrating a high sociocultural acceptability (Guyton & Hall, 2006). However, Khan et al. (2014) finds that adherence

to tax rules depended on degree of enforcement, as taxes are evaded where enforcement is absent. Data collected by Khan et al. (2014) may be subject to information bias as data is self-reported, questioning validity of results.

Conversely, increase in SLT taxes leads to an increase in illicit trade and in Bangladesh 14% of SLT is smuggled (Huque et al., 2017). In this respect, taxation demonstrates a low sociocultural acceptability as individuals partake in illegal activity to circumvent taxes. Tighter restrictions and law enforcement are required to ensure adherence.

In SA, SLT contributes significantly to countries GDP and provides a livelihood for many. Tobacco farming is a large and lucrative industry, but taxation decreases demand and revenue for the farmers and suppliers. To ensure a high sociocultural acceptability, subsidies or incentives for crop substitution need to be provided to safeguard livelihoods (Singh et al., 2020).

3.3.3 Organisational Feasibility

In many South Asian countries, SLT products are taxed differently due to their non-uniformity, therefore, in order for taxation to be effectively implemented, products need to be manufactured and distributed in the same way. The WHO recommends tobacco taxes to account for 75% of the retail price, but this is rarely applied. Organisational feasibly depends on legislation and correct law enforcement to prevent tax evasion. Study finds that the lower SLT prices in low-middle income countries (LMICs) leads to a high incidence of users, compared to those in high income countries. This demonstrates that although implementation and enforcement of taxation is difficult and requires complex, multisectoral measures, it is effective when enforced correctly.

3.3.4 Financial Feasibility

In India 2011, the total economic costs of SLT usage, including healthcare costs, was 233.6 billion rupees (₹) compared to only ₹12.6 billion collected from SLT tax (John et al., 2018). John et al.'s (2018) comprehensive literature review demonstrates the potential high financial feasibility of taxation. Raising taxes would reduce this economic burden and increase revenue for South Asian countries, however, the costs of implementation through law enforcement and subsidies will incur additional expenses (Huque et al., 2017).

Robson (2005) explains that enforcing taxation generates deadweight losses which include administrative and compliance costs, and these losses must be less than the benefits of taxation. This calculation is rarely done as it is too complex and therefore, governments have to weigh up the immediate costs of implementation and enforcement against long-term health benefits. Deadweight losses will vary between countries due to differing taxation systems and organisational factors, and they will need estimating to assess true feasibility.

3.4. Legislation

3.4.1 Technical Effectiveness

In 2012, Mumbai became the first state to ban the sale of gutka, a type of SLT, and now 24 out of the 29 states have banned the sale, manufacturing and distribution of gutka to reduce consumption. However, the lack of robust enforcement led to non-compliance as manufacturers sold SLT and additives separately, circumventing this law (Kumar et al., 2017; Salam et al., 2016) notes an increase in awareness of adverse health effects and intention to quit after the ban's instatement, however, a low technical effectiveness is observed due to the lack of enforcement. Studies carried out by Pimple et al. (2014) and Kumar and Kumar (2018) were only carried out in urban areas, therefore, their results of manufacturer non-compliance cannot be extrapolated to rural areas (Cahil et al., 2010; Tam et al., 2015).

(Khan, Huque, et al., 2014) investigates the extent Bangladesh, Nepal and Pakistan have implemented the WHO FCTC standards, which although not strictly for SLT, still apply. Found many loopholes in the legislation and that tobacco farming was incentivised, demonstrating a low technical effectiveness due to lack of enforcement.

3.4.2 Sociocultural Acceptability

The Indian gutka ban only extends to manufacturers and relies on their compliance. However, manufacturers have evaded this law and continue to sell SLT interviewed stakeholders along the SLT

supply chain and finds that Article 16 of the FCTC, prohibiting sale to and by minors (18 years old), is not adhered to, with 3/10 vendors selling to minors. However, as this data is self-reported and Siddiqi et al. (2016) had to reassure respondents they were not linked to authorities, data may be underreported, questioning the validity of this study (Communications, 2019; Robson, 2015). Overall, the literature demonstrates a low sociocultural acceptance and non-compliance.

3.4.3 Organisational Feasibility

Creating a law is not enough to reduce SLT consumption and a multi-sectoral approach is required (Kumar et al., 2017). Facilitators including training law enforcers, clearly stating responsibilities of government departments and increasing resources for enforcement to achieve a high organisational feasibility (Khan, Huque, et al., 2014) Legislation also needs to address all SLT products equally to prevent substitution of alternative products (Khan et al., 2014), which again requires uniformity of SLT products (International & Agency for Research On Cancer, 2019; Karim et al., 2020).

In SA, legislation has a low organisational feasibility due to scarce resources and complex multi-stage implementation. Further research to identify country specific barriers precluding implementation is required (Siddiqi et al., 2020; Vidyasagaran et al., 2016).

3.4.4 Financial Feasibility

The financial feasibility of legislation in SA has not been evaluated in the papers identified. A study assessing the cost effectiveness of a smoking ban on adolescents in the USA estimates savings from \$5,335 million to \$211,000 million. However, the comparability to SA is low as SA will endure additional enforcement costs due to lack of infrastructure in comparison to USA. More research into the cost effectiveness of legislation in SA is required (Leao et al., 2018; Zakarija-Grkovic & Stewart, 2020).

3.5. Health Warnings

The FCTC recommends displaying health hazards of tobacco consumption through health warning labels (HWLs). Different countries in SA have varying levels of information on HWLs as can be seen in Table 4.

Table 4. Levels of Information on HWLs

Country	Health Warning Label Present	Percentage of Health Warning Display	Presence of Picture/Graphic
India	Yes	85%	Yes
Bangladesh	Yes	50%	Yes
Pakistan	No	85% (delayed implementation)	-
Afghanistan	Yes	50%	No

Range of legislative measures enforced in countries regarding SLT packaging (Karim et al., 2020).

3.5.1 Technical Effectiveness

The effectiveness of text and pictorial SLT HWLs in India and Bangladesh (Laanpere et al., 2012). This study finds a +10.7% perception change for text-only messages, compared to a +14.7% perception change for graphic warnings, highlighting that graphic warnings have the greatest impact. However, collected self-reported data which may have resulted in respondent bias by respondents replying positively to please the interviewer.

Pakistan is not legally required to have HWLs present on SLT packaging, reducing the technical effectiveness as individuals are inadequately educated (Karim et al., 2020). Conversely, India and Bangladesh demonstrate a high technical effectiveness as warnings and graphic images are required. WHO (2003a) states that the most effective HWLs are prominent and cover both front and back of packets.

Gravely et al. (2016) assessed the effectiveness of SLT HWLs in 4 Indian states. They found no difference in respondent awareness of HWLs pre-policy (72.2%) and post-policy (73.0%) and no

difference in intention to quit pre-policy (19.8%) and post-policy (20.5%). Further research is required to determine whether or not HWLs provoke cessation behaviour change.

3.5.2 Sociocultural Acceptability

Legal requirements for percentage of the SLT packet that displays HWLs is shown in this research (Karim et al., 2020). In India HWLs cover 85% of the packet and should therefore be unavoidable, however, finds HWLs do not cover 85% and respondents are unable to read information. Similarly, Bangladesh strengthened their tobacco control laws in 2013 requiring 50% of the packet to be covered by HWLs, however, Huque et al. (2017) finds 44% of market SLT have low visibility due to small font size. Furthermore, tobacco companies in India halted production when new legislation came into effect to demonstrate their non-compliance and put pressure on decision makers, as this action threatened large-scale unemployment . These studies demonstrate a low sociocultural acceptability and low manufacturer compliance, despite passed legislation (Chaloupka et al., 2015; Singh et al., 2020).

3.5.3 Organisational Feasibility

Law enforcement of HWLs on SLT packaging is required to ensure compliance of tobacco manufacturers and a high organisational feasibility . Government support is also required to ensure high organisational feasibility as regulation standards need to be designed, enforced and assessed by the government. Enforcement also requires training of stakeholders and Huque et al. (2017) finds the unclear roles of enforcement makes implementation difficult. This demonstrates that health warning education requires a multi-sectoral approach, is not easily implemented and legislation alone is insufficient to ensure compliance (Warnakulasuriya, 2018).

3.5.4 Financial Feasibility

The calculation of financial feasibility depends on estimating the impact HWLs have on consumption and comparing them to the economic costs of implementing regulations. The papers describing HWLs do not mention the financial feasibility of this intervention, however, the WHO FCTC deems HWLs on smoking products to be cost-effective and essential for an integrated approach to tobacco control. The also emphasise that the costs of placing these warnings on packets should be borne by the tobacco industries, thereby inadvertently increasing costs to consumers and reducing consumption. However, as SLT regulations differ from smoking tobacco and the mandate for SLT is significantly less, the economic cost to countries to ensure implementation through enforcement may be too great in the short-term, resulting in a low financial feasibility.

4. Conclusion

Literature around SLT in SA is scarce due to the lack of international mandate to tackle this issue. The precedence set to tackle smoking cessation has been successful in decreasing consumption as well as morbidity and mortality rates. However, as individuals are making the switch to SLT in SA and consumption is increasing, the identification of successful strategies and interventions is evermore paramount.

Taxation interventions demonstrate a high technical effectiveness; a 5.8% reduction due to a 10% SLT price increase (Joseph, 2010). Compared to the other interventions, taxation shows the most promising cessation results, and the potential is further envisaged when observing effects of smoking taxation. Education interventions also report cessation behaviours and show potential. However, further research is required to identify interventions that cause cessation as only note cessation behaviours.

Major barriers of all these strategies are their multi-sectoral nature and South Asia's limited resources. Taxation and legislation require law enforcement, education requires training and HWLs require increasing uniformity of SLT; all complex barriers requiring multi-stage co-operation and compliance. The organisational feasibility of these interventions is low, and government and international support is needed to ensure successful implementation.

It is important to note that any conclusions drawn about strategy effectiveness are rarely binary in nature, and many complex factors determine a strategy's effectiveness.

This review has demonstrated the limited literature on SLT intervention strategies to reduce consumption in SA. This is in accordance with (Grigoriadis et al., 2019; Ketsuwan et al., 2018; Laanpere et al., 2012) systematic review and literature review which states further research needs to be carried out in countries with a high SLT burden to generate new evidence for best practice. There is a prominent research gap for studies describing the effectiveness of SLT warning labels in reducing consumption rates as only 2 studies were identified. Further research is required to determine whether HWLs on SLT products are effective in reducing consumption, and barriers hindering successful implementation need identifying. Further research into the financial feasibility of interventions also needs undertaking as cost is a major determinant for countries in SA.

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