Systematic Review

Indian J Med Res 148, October 2018, pp 396-410
DOI: 10.4103/ijmr.IJMR_1983_17

Quick Response Code:

Smokeless tobacco cessation interventions: A systematic review

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Received December 15, 2017

***Background & objectives*: Smokeless tobacco (SLT) consumption is a global health issue with about 350 million users and numerous adverse health consequences like oral cancer and myocardial disorders. Hence, cessation of SLT use is as essential as smoking cessation. An update on the available literature on SLT cessation intervention studies is provided here.**

***Methods*: Through an extensive literature search on SLT cessation intervention studies, using keywords such as smokeless tobacco, cessation, interventions, quitlines, brief advice, nicotine replacement therapy, nicotine gum, nicotine lozenge, nicotine patch, bupropion, varenicline, mHealth, *etc.*, 59 eligible studies were selected. Furthermore, efficacy of the interventions was assessed from the reported risk ratios (RRs) [confidence intervals (CIs)] and quit rates.**

***Results*: Studies were conducted in Scandinavia, India, United Kingdom, Pakistan and the United States of America, with variable follow up periods of one month to 10 years. Behavioural interventions alone showed high efficacy in SLT cessation; most studies were conducted among adults and showed positive effects, *i.e.* RR [CI] 0.87 [0.7, 1.09] to 3.84 [2.33, 6.33], quit rate between 9-51.5 per cent, at six months. Regular telephone support/quitlines also proved beneficial. Among pharmacological modalities, nicotine lozenges and varenicline proved efficacious in SLT cessation.**

***Interpretation & conclusions*: Globally, there is limited information available on SLT cessation intervention trials, research on which must be encouraged, especially in the low-resource, high SLT burden countries; behavioural interventions are most suitable for such settings. Appropriate training/sensitization of healthcare professionals, and school-based SLT use prevention and cessation programmes need to be encouraged.**

Key words Behavioural - intervention - nicotine replacement therapy - smokeless tobacco - tobacco dependence - tobacco use cessation

Smokeless tobacco (SLT) use, a form of tobacco consumed without combustion/burning, has become a global health issue with about 350 million users, maximally seen in the South-East Asian Region. Its use is associated with a myriad of adverse effects, with the major ones being oral cancer, myocardial infarction and other cardiovascular diseases[1].

Article 14 of the World Health Organization Framework Convention on Tobacco Control (WHO-FCTC) deals with tobacco addiction and dependence treatment measures. It states that 'each Party shall develop and disseminate appropriate, comprehensive and integrated guidelines based on scientific evidence and best practices, taking into

account national circumstances and priorities, and shall take effective measures to promote cessation of tobacco use and adequate treatment for tobacco dependence[2].' The formulation of this Article demonstrates the fact that the FCTC realizes the addictive potential of tobacco. Hence, the same came into existence at the Conference of the Parties 4 with the objective of development of effective treatment guidelines and measures to promote adequate treatment for tobacco dependence, by the member Parties[3]. However, the average implementation of Article 14, as reported in the Global Progress Report on Implementation of the WHO-FCTC in 2016[4], has not been significant, *i.e.* 50 per cent, between 2012 and 2016, as compared to the other substantive articles of the Convention[5]. According to the guidelines of Article 14, tobacco cessation has multiple dimensions to it, comprising behavioural interventions [brief advice, telephone counselling *via* national toll-free quitlines (NQLs)], pharmacotherapy, nicotine replacement therapy (NRT) and non-nicotine therapy - bupropion and varenicline, involvement of the healthcare system/ healthcare workers, noting individual's tobacco use[2].

In spite of widespread use and adverse health consequences of SLT, there is a dearth of evidence-based published literature on SLT cessation as compared to that on smoking cessation. A systematic review and meta-analysis available for SLT cessation intervention trials was the Cochrane review reporting data till 2015, majorly for studies performed in the United States of America (USA), with a few in the Scandinavian countries[6]. Here we provide a global update on the existing literature regarding studies on the demand reduction measures concerning SLT dependence and cessation, along with evidence-based discussion of the efficacy of each.

Material & Methods

To search the literature and systematically review the various demand reduction measures for SLT dependence and cessation, an online search strategy was performed since inception (1966) for PubMed to 2017, and the resultant data evaluated, as shown in Figure.

Extensive PubMed and Google literature search was performed using a combination of keywords such as smokeless tobacco, cessation, interventions, dependence, treatment, quitlines, behavioural, brief advice, nicotine replacement therapy, nicotine gum, nicotine lozenge, nicotine patch, bupropion, varenicline, dentist, mHealth and mobile. This search produced 28,756 results, the titles of which were assessed and

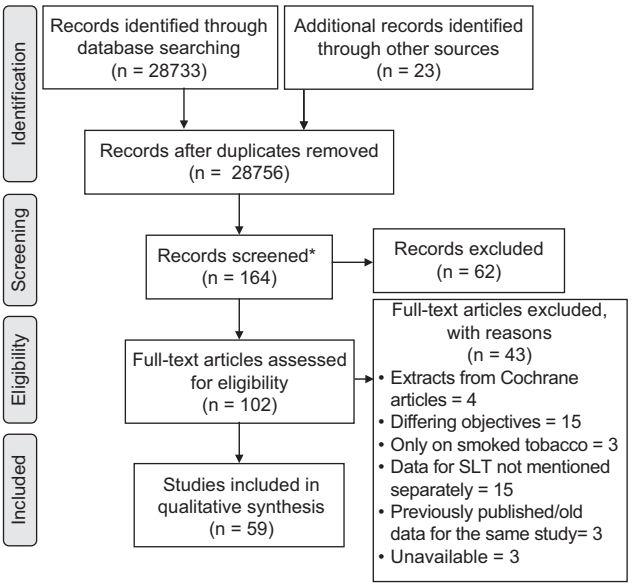

Figure. Flow chart showing search strategy. *These were the number of articles which were chosen for screening of their abstracts after excluding other articles deemed irrelevant based on their titles.

those not relevant were excluded. Abstracts of the remaining publications and full papers were reviewed to identify those that fulfilled the inclusion criteria. Among these, 59 articles were found to be of potential interest and were included.

The criteria for data selection, obtained from the search above, were as follows:

Inclusion criteria

Studies performed for SLT cessation interventions; studies performed for cessation of both smoking and SLT but also reporting data specific to SLT cessation; those with the most recent results for consecutively reported studies; SLT cessation intervention studies performed either on adults or adolescents were included. Only English language literature was included.

Exclusion criteria

Studies only for smoking cessation; studies for cessation of both smoking and SLT but not providing separate information for SLT cessation; literature reviews; repetitive data (example: extracts from already included Cochrane articles); articles on tobacco use screening and counselling; study protocols; studies with differing objectives; old published data for the same study; unavailability of the complete report for reference in case of lack of clarity of information in the abstract; documents in languages other than English, were excluded.

The current status of availability of the SLT dependence and cessation measures globally and the efficacy of each of the SLT cessation intervention was assessed based on the risk ratio (RR) [confidence intervals (CIs)] and quit rates reported for each of them in the various resultant studies.

Results

Behavioural interventions for smokeless tobacco (SLT) cessation

Twenty randomized controlled trials (RCTs) (case-control studies) on behavioural interventions for SLT cessation were reported; sixteen were conducted in the USA[7-22], three in India[23-25] while only one study was reported from Sweden[26]. Most studies had majority of adult participants while three were conducted among the youth[13,20,24]. Among the 19 studies having a follow up of six months or more, 10 studies reported statistically and clinically significant benefits with RR (CI) ranging between 1.33 (1.09, 1.63) and 3.84 (2.33, 6.33)[9-11,13,14,17-19,22,23], in five studies the CIs did not specify a clinical benefit but did not exclude one either, with an RR (CI) between 1.08 (0.84, 1.39) and 3.72 (0.79, 7.47)[7,12,16,20,26] and four studies had RRs just below or above one and relatively narrow CI suggesting no important benefit or harm *i.e.* RR (CI) from 0.87 (0.7, 1.09) upto 1.07 (0.87, 1.31)[8,15,21,24]. Overall, the RR (CI) ranged from 0.87 (0.7, 1.09) to 3.84 (2.33, 6.33). The one case-control pilot study conducted by Jhanjee *et al*[25] showed an RR (CI) of 1.80 (0.77, 4.25) at the end of three months of treatment (Table I). Therefore, the trials suggested a benefit of behavioural interventions in SLT cessation.

Twelve non-case-control studies employing behavioural interventions for SLT cessation interventions were found, among which eight had a follow up of six months or more[27-34] and four had a follow up of less than six months[35-38]. Of these, two studies were performed in India[30,32], one in Pakistan and United Kingdom (UK)[33] and the rest were done in the USA[27-29,31,34,38]. Among the group having intervention/follow up of less than six months, the quit rate ranged from eight per cent (at the end of one month, Gala *et al*) to 58 per cent (after 1.5 months, Fisher *et al*)[37,38]. The quit rate of SLT users in the trials having a longer follow up of six months or more was between 9 per cent (at six months, Walsh *et al*) and 51.5 per cent (after 12 months, Mishra *et al*)[27,30] (Table II).

National toll-free quitlines (NQLs): Telephone support has been shown to be efficacious in SLT cessation. Among the aforementioned studies, 10 RCTs conducted in the USA, in which telephone support formed part of the intervention showed their benefit, with RR (CI) ranging between 1.32 (0.94, 1.86) and 3.84 (2.33, 6.33) (Table I)[7,9,10,12-14,16,17,19,22]. Four non case-control studies[28,34,35,39] reported a beneficial effect of telephone support for SLT cessation. A quit rate of 20 per cent among SLT users at the end of 18 months of the quitline activity in Rajasthan (India), a voluntary activity of Rajasthan Cancer Foundation, was reported[34]. A media campaign (comprising of quitline component) in Nebraska (USA)[28] reported a quit rate of 11.5 per cent at the end of 12 months and Eakin *et al* (USA)[35] reported a quit rate of 16 per cent at the end of three months in their multi-component behavioural intervention programmes including frequent telephone contact/counselling with the SLT users. Mushtaq *et al*[39] reported a quit rate of 43 per cent at the end of seven months; however, the intervention also involved delivery of NRT in addition (Table II).

Pharmacotherapy for SLT cessation

Nicotine replacement therapy (NRT): Fifteen RCTs on NRT for SLT cessation were found. Twelve trials were performed in the USA[40-51] while three were conducted in the UK among Bangladeshi-resident women[52-54]. Except one[44], the rest of the studies had adult participants. Among the 12 studies from the USA with a follow up of six or more months, neither nicotine patch[42-45,49] nor nicotine gum[40,41] increased abstinence; however, the five studies of nicotine lozenges showed increased SLT abstinence, with RR (CI) between 0.73 (0.34, 1.55) and 1.53 (1.12, 2.09)[46-48,50,51] (Table I). In the Bangladeshi Stop Tobacco Project, NRT proved effective among 419 Bangladeshi female resident SLT users of UK with RR (CI) of 4.93 (2.02, 2.00) at four weeks, whereas the opposite was noted for nicotine gum or patch among 239 and 130 Bangladeshi origin participants living in the UK[52-54] (Table I).

Five non-case-control studies on NRT usage for SLT cessation were found. All were conducted among adults and had a follow up period of six months or more. Only one study was performed in Sweden[55] and the rest in the USA[39,56-58]. Three studies tested the efficacy of nicotine gum alone in SLT cessation[55-57], while one study[58] employed nicotine lozenge; Mushtaq *et al*[39], utilised nicotine gums, patches and lozenges in their participants. A higher benefit of nicotine lozenge in SLT cessation was also observed by Ebbert *et al*[58], *i.e.* 47 per cent quit rate at six months. The quit rate

Table I. Details of the smokeless tobacco (SLT) cessation intervention randomized controlled trials (RCT) and cohort studies

Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
NRT with behavioural interventions										
Boyle *et al*[40]	1992	USA	RCT	100	50	50	Average age 32	6 wk	1, 6 and 12 months	1.00 (0.52-1.94)
Hatsukami *et al*[41]	1996	USA	RCT	210 males	106	104	Average age 31	Pharmacotherapy - 8 wk, Behaviour therapy - 10 wk	12 months	0.98 (0.63-1.54)
Howard-Pitney *et al*[42]	1999	USA	RCT	410 males	206	204	Average age 36		6 months	1.12 (0.86-1.45)
Hatsukami *et al*[43]	2000	USA	RCT	402	201	201	Average age 31	10 wk	Up to 62 wk	1.27 (0.92-1.74)
Stotts *et al*[44]	2003	USA	RCT	303 males	198	105	14-19	6 wk	12 months	1.26 (0.57-2.78)
Croucher *et al*[54]	2003	UK	Pilot study	130 UK-resident Bangladeshi women	65	65	Average age 42.5	4 wk		1.25 (0.58-2.68)
Ebbert *et al*[45]	2007	USA	RCT	42 males	10	11	Average age 34-38 (20-56)	8 wks	6 months	1.10 (0.19-6.41)
Ebbert *et al*[46]	2009	USA	RCT	270 (264 males and 6 females)	136	134	18 and above (average age 37)	12 wk	6 months	1.40 (0.88-2.22)
Ebbert *et al*[47]	2010	USA	RCT	60 males	30	30	18 yr and above (average age: randomized group 43.6±16.0, control group 42.4±11.7)	12 wk	6 months	0.73 (0.34-1.55)
Croucher *et al*[53]	2012	UK	Cohort	239 South Asians	219	20	Average age 45	4 wk	1 yr	1.62 (0.94-2.80)
Croucher *et al*b[52]	2012	UK	Cohort	419 UK resident Bangladeshi women	330	89	Average age 48.9	4 wk		4.93 (2.02-12.00)
Ebbert *et al*[49]	2013	USA	RCT	52	25	27	Average age 41 (18-55)	8 wk	6 months	1.73 (0.65-4.59)
Ebbert *et al*[48]	2013	USA	Pilot study	130 (125 males and 5 females)	40	41	18 yr and above (average age 38)	12 wk	6 months	1.03 (0.32-3.27)

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
Danaher *et al*[50]	2015	USA	RCT	407 (397 males and 10 females)	205	202	Average age 35	12 wk	3 and 6 months	1.53 (1.12-2.09)
Severson *et al*[51]	2015	USA	RCT	1067 males	357	354	Average age 36	12 wk	3 and 6 months	1.36 (1.12-1.66), 1.43 (1.20-1.71)
Behavioural interventions only										
Gupta *et al*[23]	1992	India	Cohort study	7033 males and females SLT users	4619	2414	15 yr and above	Intervention group: Concentrated programme of education against tobacco use. Control group: minimal advice against tobacco use	10 yr	2.79 (2.36, 3.29)
Cummings *et al*[8]	1995	USA	RCT	733 males	316	417	Average age 36	2 yr	2 yr	0.98 (0.76-1.27)
Stevens *et al*[7]	1995	USA	RCT	518 males	245	273	15 yr and above	18 months	3 and 12 months	1.47 (0.83-2.60)
Severson *et al*[9]	1998	USA	RCT	633	394	239	15 yr and above	3 and 12 months	3 and 12 months	3.03 (1.44-6.37)
Walsh *et al*[10]	1999	USA	RCT	360	171	189		Intervention group: Oral exam (3-5 min) with feedback, photos of ST effects, advice to quit, self-help manual, optional brief counselling (15-20 min) about quit date, triggers, tobacco withdrawal); optional nicotine gum (to mitigate withdrawal symptoms), optional phone counselling. Controls: Oral examination only	Up to 1 yr	2.21 (1.5-3.25)
Andrews *et al*[11]	1999	USA	RCT	633 (632 males and 1 female)	394	239	15 yr and above (Average age 36.2)	Intervention: Determine tobacco use, identify oral disease, strong advice to quit, set quit date within two wk, motivation video, written material, call patient within two wk; Usual care	3 and 12 months	3.26 (1.49-7.17)
Cigrang *et al*[12]	2002	USA	Pilot study	60 males	31	29	Average age 31 (19-47)	Programme using motivational interviewing consisted of a treatment manual, video, and two supportive phone calls (about 10 min each) from a cessation counsellor	3 and 6 months	2.18 (0.62-7.65)

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
Walsh *et al*[13]	2003	USA	RCT	307 males	141	166	14-18	Peer-led component (50-60 min): Interactive, peer-led team directing education with videotape and brief discussion (10-15 min), slide show (20-30 min), and small-group discussion on tobacco industry advertising (10 min). Dental component with oral cancer screening examination by a dentist or hygienist. Included advice to quit, a self-help guide, tobacco cessation counselling in small groups (15 min), and a phone call on the quit date (5-10 min). Control group: No intervention	1 and 12 months	1.95 (1.22-3.10)
Boyle *et al*[14]	2004	USA	RCT	221 males	109	112	Average age 36	Behavioural therapy 1. S-H materials (control) 2. S-H material + 4 proactive telephone counselling calls. Initial call four days after S-H material mailing. Subsequent calls were negotiated and placed emphasis on support, problem-solving, and use of cognitive-behavioural strategies including monitoring tobacco behaviour patterns, goal setting, finding alternative coping options and planning for high-risk situations or cues associated with tobacco use	6 months	1.61 (1.09-2.39)
Gansky *et al*[15]	2005	USA	RCT	637	285	352	17-20	Intervention: 1. Three-hour video conference training for athletic trainers/ dentists/hygienists; follow up newsletter for athletic trainers 2. Oral cancer screening by dentists/hygienists 3. Athletic trainer follow up and referral with follow up by trainer on quit date, plus 3 booster sessions one week apart 4. Peer-led component with education meeting (50-60 min). Control: anti-tobacco education	1 yr	0.98 (0.80-1.20)

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
Severson *et al*[16]	2007	USA	RCT	1069 males	535	534	Average age 39 (17-82)	Assisted self-help including: 1. Phone support (two calls, 10-15 min, with quit date setting and tobacco withdrawal management) 2. Self-help manual (60 pages) 3. Self-help videos (20 min). Controls received a self-help manual	12 months	1.32 (0.94-1.86)
Stigler *et al*[24]	2007	India	Cohort study	209 girls and boys	100	109	10-16	Four months	2 yr (here, outcome of 1 yr)	0.87 (0.7-1.09)
Severson *et al*[18]	2008	USA	RCT	2523 males	1260	1263	Average age 36.8	Intervention (enhanced website): a guided interactive programme for quitting tobacco, useful resources and other weblinks, web forums namely 'Talk with Others' and 'Ask an Expert', planning to quit and staying quit modules Controls (basic website): a static website having a pocket guide titled "Enough Snuff "and a section with useful materials and links	3 & 6 months	1.59 [1.26, 2.02]
Boyle *et al* (the Chew Free Minnesota study)[17]	2008	USA	RCT	406 (399 males and 7 females)	201	205	Average age 40	A self-help manual plus proactive phone-based cessation counselling. Phone-based treatment included up to 4 calls in support of quitting and personalized cognitive and behavioural tobacco treatment strategies (*e.g.,* setting a quit date, examining use patterns, developing stress-reduction skills, avoiding known triggers to use). Controls received usual care (*i.e.,* self-help manual only)	3 and 6 months	3.16 (1.99-5.03)
Severson *et al*[19]	2009	USA	RCT	785 males	392	393	Average age 30	Telephone counselling by a trained cessation counsellor who offered assistance in quitting ST use (3 calls: First call one week after dental	6 months	3.84 (2.33-6.33)

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
								examination, second call three weeks after quitting materials were mailed, third call a few days after participant's quit date or two weeks after the second call); a mailed videotape and self-help guide tailored for the military. Controls received usual care		
Walsh *et al*[20]	2010	USA	RCT	4731 males	123	123	14-18	Peer-led educational session (45 min), oral exam with feedback, and three nurse-led group cessation counselling sessions (one hour each, optional). Peer-led sessions included video/slide presentation and discussion about the presentations and how the tobacco industry targets young males. Oral examination included feedback about any tobacco-related lesions, advice to quit using ST, assessing of readiness to quit. The first nurse-led session focused on assessment, education, preparation to get ready to quit, and the importance of social support; the second session focused on setting a quit date and skills to cope with cravings and temptation to use; the third session reviewed progress and focused on relapse prevention. Controls received no intervention	1 yr	1.08 (0.84-1.39)
Danaher *et al*[21]	2013	USA	RCT	1716 (1656 males and 60 females)	857	859	Average age 21 (14-25)	Behavioural therapy 1. Basic condition (control): Static website content including an 'Enough Snuff' pocket guide, a resource section with informational materials and links to websites offering content for ST cessation and relaxation strategies 2. Enhanced condition: Interactive and multimedia features with functionality to create online lists, watch videos, and	3 and 6 months	1.07 (0.87-1.31)

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
								a Web blog moderated by research staff. Automated email reminders encouraged website use and provided supportive measures		
Danaher *et al*[22]	2015	USA	RCT	1683 (1641 males and 42 females)	1259	424	Average age 38	Behavioural therapy: 1. Web only: Automated, tailored and interactive intervention delivered as text, activities, and videos 2. Quitline only: Proactive telephone counselling through the California Tobacco Chewers' Helpline 3. Web + Quitline: Received the Web and Quitline Interventions 4. Control: Self-help printed guide	3 and 6 months	1.33 (1.09-1.63)
Virtanen *et al* (the FRITT study)[26]	2015	Scandinavia (Sweden)	RCT	241 males and females	94	100	18-75	Behavioural therapy: 1. Structured tobacco use intervention based upon the 5 A's specifically referring to oral health with reference to pharmacotherapy, more intensive counselling in the primary care clinic and the telephone quitline. Hand-outs supplied 2. Usual care	6 months	3.72 (0.79-17.47)
Jhanjee *et al*[25]	2017	India	Pilot study	100 women	50	50	Average age 43	3 months		1.80 [0.77, 4.25]
Non-nicotine therapy (with behavioural interventions): Bupropion										
Glover *et al*[59]	2002	USA	Double-blind RCT	70 males	35	35	18 & above	7 wk	5 wk	2.73 [1.07, 7.72] (at 7 wk), 1.93 [0.71, 5.47] (at follow up)
Dale *et al*[60]	2002	USA	RCT	68 (67 males, 1 female)	34	34	Average age 37	12 wk	24 wk	1 [0.27, 3.68]
Dale *et al*[61]	2007	USA	RCT	225 males	113	112	Average age 38 (19-72)	12 wk	24 & 52 wk	0.87 [0.51, 1.46]

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Authors	Year	Country	Study type	Subject characteristics				Intervention period/method	Follow up period	Risk ratio and CI
				Total	Case (n)	Control (n)	Age (yr)			
Non-nicotine therapy (with behavioural interventions): Varenicline										
Fagerstrom *et al*[62]	2010	Scandinavia (Sweden & Norway)	RCT	431 (385 males & 46 females)	213	218	Average age 43.9	12 wk	6 months	1.33 [1.05, 1.69]
Ebbert *et al*[63]	2011	USA	RCT	76 males	38	38	Average age 41	12 wk	3 & 6 months	1.42 [0.79, 2.55]
Jain *et al*[64]	2014	India	Double-blind RCT	237 (mostly males)	119	118	Average age 34.2	12 wk		2.60 [1.20, 4.20]

SLT, smokeless tobacco; RCT, randomized controlled trials

for NRT in general in SLT cessation ranged from 7 to 47 per cent (Table II).

Non-nicotine therapy: A total of six RCTs, three each for bupropion and varenicline for SLT cessation, were found, and all were conducted among adults. All the three bupropion-related studies[59-61] were performed in the USA, with one having a follow up of less than six months[59] and the other two having a follow up period of more than six months[60,61]; however, none of these studies showed a positive effect on tobacco abstinence. The three trials of varenicline, were conducted in Scandinavia[62], USA[63] and India[64] with one having a follow up of less than six months[64] and the other two having a follow up period of more than six months. These studies showed increased tobacco abstinence rates at six months compared to placebo (Table I). A single non-case-control pilot study in USA reported a quit rate of 15 per cent among adult participants at the end of 12 wk of treatment with varenicline and 10 per cent at the end of six months of follow up[65].

Discussion

Globally, a dearth in the published literature regarding SLT cessation intervention trials has been observed (only for 3% WHO-FCTC ratified Parties, *i.e.* 5/179 Parties - Sweden, Norway, India, United Kingdom and Pakistan, apart from the USA). Further, a deficiency in the tobacco cessation support availability in most low-resource and high SLT burden Parties has been reported in the MPOWER 2017, which is required to be strengthened[66].

Studies assessing the efficacy of SLT cessation interventions, especially behavioural interventions, must be carried out by all countries, especially those having a high burden of SLT consumption, as behavioural interventions have been found to have maximum benefit in SLT cessation as compared to pharmacotherapy[7-38]. The Cochrane review (2015) on the SLT cessation intervention trials also showed results along similar lines, with behavioural interventions proving most efficacious for SLT cessation[6]. Another Cochrane review (2012) also suggested almost similar efficacy of behavioural interventions in both smoking and SLT cessation[67]. The importance of behavioural intervention in the form of brief advice by healthcare professionals for successful SLT cessation has also been undermined and not much research has been performed. The Global Adult Tobacco Survey (GATS) performed in India, Bangladesh, Kenya, Pakistan, Thailand

Table II. Details of smokeless tobacco cessation intervention non case-control studies

Authors	Country	Year	Study type	Subject characteristics		Intervention period	Follow up period	Quit rate (%)
				n	Age (yr)			
Behavioural interventions only								
Eakin *et al*[35]	USA	1989	Pilot study	25 males			3 months	16
Masouredis *et al*[36]	USA	1997	RCT	1208 males			3 months	24
Walsh *et al*[27]	USA	1998	Pilot study	304 males	Minor and major league players		6 months	9
Boyle *et al*[28]	USA	1999	Media campaign	205 males	21-79 Average age=37.5		1 yr	11.5
Fisher *et al*[37]	USA	2001	Cohort study	50 (49 males, 1 female)	18 and above		6 wk	58
Lichtenstein *et al*[29]	USA	2002		363 female romantic partners of male smokeless tobacco users	Average age=40		6 months	32
Gala *et al*[38]	USA	2008	Cohort study	18 males	18 and above		1 month	8
Mishra *et al*[30]	India	2009	Cohort study	104 males			1 yr	51.5
Meier *et al*[31]	USA	2013	Institutional intervention	2293 males	18-56 (average age =20.6)		4 yr	16.4
Mishra *et al*[32]	India	2014	Community-based intervention	304 women		1 yr		33.5
Siddiqi *et al*[33]	UK, Pakistan	2016	Pilot study	32 (16 males and 16 females)	18 and above		6 months	12.5
Gupta *et al*[34]	India	2016	Quitline	1105	Majority between 16-25	1 call session	1 wk, 1 month, 3 months, 6 months, 1 yr	20.0 (at 18 months)
NRT with behavioural interventions								
Sinusas *et al*[56]	USA	1993	Preliminary trial	14 males		2-4 months	Up to 12 months	21 (at the end of treatment), 7 (at follow up)
Hatsukami *et al*[57]	USA	2003	Pilot study	40 males	Average age=31.9	12 wk	At 26 wk	25 (at end of treatment) 15 (at follow up)
Ebbert *et al*[58]	USA	2007	Open-label, one-arm, phase II clinical trial	30 (29 males, 1 female)	Average age=35.4	12 wk	6 months	53 (at end of treatment), 47 (at follow up)
Wallstrom *et al*[55]	Sweden	2010	Prospective, open, non-randomized intervention trial	50 males	Average age=42.2	Six wk	3, 6, 12 months	30 (at 12 months)

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Authors	Country	Year	Study type	Subject characteristics		Intervention period	Follow up period	Quit rate (%)
				n	Age (yr)			
Mushtaq *et al*[59]	USA	2015	Cohort study	374 males	Average age=41.3		7 months	43
Non-Nicotine therapy with behavioural interventions: Varenicline								
Ebbert *et al*[47]	USA	2010	Pilot study	20 males	Average age=42.8	12 wk	6 months	15 (at 12 wk) 10 (at 6 months)

NRT, Nicotine replacement therapy

and Uganda reported a considerable variation while tobacco cessation counselling by health professionals (greater consideration for smokers than SLT users)[68]. Two trials in India have been performed successfully utilizing brief advice for tobacco cessation among both smokers and SLT users *i.e.* an overall quit rate of 67.3 per cent was reported by Kaur *et al*[69], and 2.6 per cent by Sarkar *et al*[70], however, the quit rate for SLT users has not been mentioned separately. There is also a lack of formal training for tobacco cessation among health profession students and school personnel, as seen in the Global Health Professions Student Survey and Global School Personnel Survey, respectively[68]. Hence, the same must be encouraged and expanded up to the grass root level, *i.e.* among health workers working in the villages. However, the likelihood of healthcare professionals giving brief advice will be more if tobacco use is recorded in the medical history; but only 20 per cent of countries follow this[71].

Quitlines and telephone support for SLT cessation have proven efficacious as noted in literature[7,9,10,12-14,16,17,19,22,28,34,35,39]. In a Cochrane review[6], the pooled risk ratio of 10 studies conducted in the USA, in which telephone support formed part of the intervention, indicated benefit in SLT cessation. It was also noted that a combination of oral examination and telephone support was more beneficial (RR- 2.07, CI-1.61, 2.66), than oral examination alone[6]. However, according to the MPOWER 2017 data[66], only one-third, *i.e.* 31 per cent, Parties have NQLs, the establishment of which needs to be encouraged. In addition, the phone number of the quitlines could be mentioned on the SLT product packet health warnings. To ensure broader coverage, the primary healthcare system, services for treating tuberculosis and human immunodeficiency virus/acquired immunodeficiency syndrome, dental set-ups and non-communicable diseases programmes could also be involved[72].

mHealth services for SLT cessation can be employed as an easy and cost-effective option, especially in the low-income group countries, for smoking cessation. Very few WHO-FCTC ratified countries have provided this facility (24 Parties)[72]. A national, bilingual mCessation programme (tobacco cessation through mobile text messages) was started in 2016 in India. Evaluation at the end of the first year, of more than 12,000 registered users, demonstrated an average quit rate of about seven per cent among both smokers and SLT users six months after enrolment[66]. Based on the information from 12 studies reported in the Cochrane review, 2016[73] (performed

mostly in high-income countries such as USA, Australia, UK, Switzerland, New Zealand), smokers who received the mobile phone-based support were around 1.7 times more likely to quit than those who did not, proving this intervention efficacious, which could also be utilized for SLT cessation.

Most studies had adult participants. SLT prevention and cessation programmes must be facilitated in schools such as Project MYTRI[24], especially among students of the lower strata of the society and with a higher early tobacco usage initiation tendency (smoking and/or SLT or both).

In conclusion, SLT cessation intervention-based research needs encouragement globally, especially in the low-income group countries which are deficient in tobacco cessation support. Behavioural interventions have been proven to be an efficacious and feasible modality for tobacco cessation in all settings (low and high resource). Sensitization and imparting of training regarding the same to health professionals and SLT use prevention and cessation-related school programmes need to be encouraged.

***Financial support & sponsorship*:** None.

***Conflicts of Interest*:** None.

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