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Evaluating the impact of motivational interviewing on adolescents' oral hygiene: A school-based randomized controlled trial

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Abstract:

Poor oral hygiene among adolescents remains a major public health concern due to inadequate plaque control and unhealthy oral hygiene practices. Therefore, it is of interest to evaluate the effectiveness of Motivational Interviewing (MI) versus Standard Oral Health Education (SOHE) among 148 adolescents aged 13–18 years. Clinical outcomes, including OHI-S, Plaque Index and Gingival Index, were assessed at baseline and 3 months using ANCOVA. Motivational interviewing achieved significantly greater improvements in oral hygiene indices and brushing behaviours than SOHE, with an adjusted OHI-S mean difference of -0.38 (95% CI: -0.55 to -0.21 ; $p < 0.001$). Thus, data shows that a brief, school-embedded MI program outperforms standard education in translating oral health knowledge into sustained behavioural practice among adolescents, offering a scalable model for school-based prevention programs.

Keywords: Adolescents, school, motivating, oral health, counselling

Background:

Adolescence is a critical developmental stage marked by rapid biological maturation, psychosocial transition and increasing autonomy in health-related decision-making. Although early adolescence is primarily influenced by parental guidance, mid-to late adolescence (13–18 years) is characterised by growing independence, identity exploration and strong peer influence, all of which shape self-care routines including oral hygiene behaviour. Despite widespread awareness campaigns and school-based oral health programmes, oral hygiene behaviour among adolescents remains suboptimal in both developed and developing countries, including India [1]. In traditional school dental education, oral health promotion relies heavily on didactic, one-way communication models under the assumption that increasing awareness automatically results in behavioural change [2]. However, longitudinal behavioural research shows that mere transmission of knowledge does not reliably translate into daily preventive action; especially in adolescents whose health behaviour shaped more by motivation, self-belief, habit reinforcement and peer is modelling than by information delivery [3]. A shift toward behavioural science-informed approaches is therefore essential in adolescent oral health promotion. Motivational Interviewing (MI), originally developed for addiction counselling, represents a paradigm shift from directive instruction to collaborative guidance. Rather than attempting to externally persuade, MI aims to help individuals access and articulate their own internal reasons for change, thereby promoting self-determination. The underlying philosophy of MI emphasises three key principles: collaboration (not confrontation), evocation (not imposition) and autonomy support (not compliance enforcement) [4]. Systematic reviews confirm that MI-based counselling is more effective than conventional education alone in improving oral health behaviours and reducing plaque indices when adherence not knowledge is the primary determinant of outcome [5]. Motivational interviewing offers a theoretically coherent, brief and scalable counselling method that aligns with adolescent psychology by eliciting intrinsic reasons for change and strengthening self-regulation. However, rigorous evidence from school-based randomized controlled trials in India is scarce,

particularly those evaluating MI against standard oral health education using objective clinical outcomes (OHI-S, Plaque Index and Gingival Index) over a meaningful follow-up [6, 7]. Therefore it is of interest to report whether MI produces clinically significant improvements in plaque control within real-world school settings would close a critical evidence gap, inform public health programme design and guide resource allocation toward behaviourally effective, adolescent-responsive prevention strategies.

Materials and Methods:

This study was designed as a parallel-arm, individually randomized controlled trial conducted in secondary schools. All trial procedures were carried out on school premises during academic hours in coordination with school administrators. The inclusion criteria were: adolescents aged 13–18 years enrolled in participating schools, who were able to provide assent with parental consent and who were present at baseline examination. The exclusion criteria included: ongoing orthodontic treatment or medical conditions that interfered with oral examination or counselling, acute dental pain/infection requiring immediate care and prior structured behaviour-change counselling for oral hygiene in the preceding 6 months. A list of eligible students was obtained from class registers. An information sheet and consent pack (parental consent + participant assent) were distributed one week prior to baseline. Only students with completed consent/assent were enrolled. The primary outcome was the between-group difference in change in OHI-S (Greene & Vermillion) from baseline to 3 months. Sample size was estimated for a two-sided comparison of means (independent groups), with $\alpha = 0.05$ and power = 80%. Thus, 63 per group assuming 15% attrition, the adjusted size was: $63 \div 0.85 \approx 74$ per group. Hence, total sample ≈ 148 . Participants were randomized 1:1 to Motivational Interviewing (MI) or Standard Oral Health Education (SOHE) using a computer-generated permuted block sequence (varying block sizes of 4 and 6), stratified by class grade (9–10 versus 11–12) to balance maturity/academic pressure. Allocation was concealed using sequentially numbered, opaque, sealed envelopes prepared off-site by an independent administrator. Envelopes were opened after

baseline assessment. MI was delivered as a brief, structured, one-to-one counselling approach that emphasized collaboration, evocation and support for autonomy. Each participant received a 10-15-minute initial session in a private room on school premises, followed by two booster contacts of ~7-10 minutes at 2 and 6 weeks. The session flow was standardized as follows: (i) rapport and agenda setting; (ii) exploration of current brushing/flossing habits and sugar exposure; (iii) evocation of importance and confidence for change; (iv) identification of barriers and facilitators; (v) co-creation of a specific, time-bound brushing goal (with night-time emphasis); and (vi) implementation planning (cue, time, place, reminder, coping plan). A printed, wallet-sized goal card summarizing "When-Where-How" was issued at the end of each contact. Fidelity was maintained using a brief checklist (MI spirit present; ≥2 reflections per open question; goal set; plan documented). The data was analysed using Statistical Package for Social Sciences (SPSS) version 26.0 (IBM; Chicago). Between-group difference in change in OHI-S, Plaque and gingival index at 3 months was assessed using Analysis of Covariance (ANCOVA). Effect sizes were reported as adjusted mean differences with 95% CIs. The level of significance was set at 5%

Results:

The current randomized controlled trial was done on 148 school children (MI = 74; SOHE = 74). MI and SOHE groups were well balanced at baseline. The mean age was 15.2 ± 1.5 years in MI and 15.1 ± 1.6 years in SOHE (t=0.37; p=0.713, NS). Females were 38/74 (51.4%) in MI and 36/74 (48.6%) in SOHE (χ²=0.08; p=0.776, NS). Students in grades 9-10 were 39/74 (52.7%) in MI and 40/74 (54.1%) in SOHE (χ²=0.03; p=0.861, NS). Clinical indices were nearly identical: baseline OHI-S was 2.62 ± 0.61 (MI) vs 2.60 ± 0.60 (SOHE) (t=0.20; p=0.839, NS); Plaque Index 1.80 ± 0.42 vs 1.81 ± 0.41 (t=0.14; p=0.890, NS); Gingival Index 1.48 ± 0.38 vs 1.49 ± 0.37 (t=0.16; p=0.872, NS). Behaviors were comparable: twice-daily brushing 22/74 (29.7%) vs 21/74 (28.4%) (χ²=0.03; p=0.855, NS); night brushing ≥5 days/week 18/74 (24.3%) vs 17/74 (23.0%) (χ²=0.03; p=0.869, NS); interdental aid use ≥3 days/week 9/74 (12.2%) vs 8/74 (10.8%)

(χ²=0.07; p=0.791, NS). Overall, there were no significant baseline differences between groups. ANCOVA model included post-intervention OHI-S as dependent variable, treatment arm as fixed factor, baseline OHI-S as covariate and grade stratum. Negative Δ favours MI. Effect size (adjusted): -0.38 OHI-S units; *=Significant **Table 1** shows that both groups improved, but the MI group improved more. At baseline, OHI-S scores were similar (MI 2.62 ± 0.61; SOHE 2.60 ± 0.60). At 3 months, MI decreased to 1.82 ± 0.58 while SOHE decreased to 2.18 ± 0.59. The within-group change was larger for MI (-0.80) than for SOHE (-0.42). The raw between-group difference at 3 months was Δ = -0.36 in favour of MI. After adjusting for baseline OHI-S and grade, the mean difference remained significant at -0.38 units (95% CI -0.55 to -0.21), with ANCOVA F (1,144) =22.8; p<0.001. These findings indicate a clear and clinically meaningful advantage of MI over standard education in reducing plaque over 3 months. Negative adjusted mean differences favour MI. ANCOVA adjusted for baseline value and grade stratum; *=Significant **Table 2** shows that both groups demonstrated improvement in Plaque Index and Gingival Index over the 3-month period; however, the reduction was noticeably greater in the MI group than in the SOHE group. The mean Plaque Index in the MI arm decreased from 1.80 ± 0.42 at baseline to 1.22 ± 0.39 at 3 months (a reduction of 0.58 units), compared with a smaller reduction in the SOHE arm from 1.81 ± 0.41 to 1.49 ± 0.40 (a reduction of 0.32 units). MI effect on OHI-S was consistent across subgroups, with no evidence of effect modification. Among females, the adjusted mean difference was -0.40 (95% CI -0.62 to -0.19) with a significant model effect (F(1,144)=12.8; p<0.001) and a non-significant interaction (p=0.64). Among males, the effect was -0.36 (95% CI -0.59 to -0.13) (F(1,144)=9.9; p=0.002). By grade, students in grades 9-10 had an effect of -0.41 (95% CI -0.63 to -0.19) (F (1,144) =11.7; p=0.001; interaction p=0.57) and those in grades 11-12 had -0.35 (95% CI -0.58 to -0.11) (F(1,144)=8.6; p=0.004). In all cases, the direction and magnitude were similar to the overall treatment effect, indicating no sex- or grade-based effect modification.

Table 1: Primary Outcome: OHI-S at baseline and 3 months

Measure	MI (n=74)	SOHE (n=74)	Within-group Change	Between-group (raw)	Adjusted Mean Difference (95% CI)
	Mean ± SD	Mean ± SD			
OHI-S (Baseline)	2.62 ± 0.61	2.60 ± 0.60	—	—	—
OHI-S (3 months)	1.82 ± 0.58	2.18 ± 0.59	MI: -0.80; SOHE: -0.42	Δ = -0.36	-0.38 (-0.55, -0.21) F(1,144)=22.8, p<0.001*

Table 2: Plaque index and gingival index (baseline vs 3 months)

Outcome	Time	MI (n=74)	SOHE (n=74)	Within-group Change	Adj. Mean Diff (95% CI)	ANCOVA F(df, p)
		Mean ± SD	Mean ± SD			
Plaque Index	Baseline	1.80 ± 0.42	1.81 ± 0.41	—	—	—
Plaque Index	3 months	1.22 ± 0.39	1.49 ± 0.40	MI: -0.58; SOHE: -0.32	-0.25 (-0.37, -0.13)	F(1,144)=15.9, p<0.001*
Gingival Index	Baseline	1.48 ± 0.38	1.49 ± 0.37	—	—	—
Gingival Index	3 months	1.01 ± 0.34	1.23 ± 0.36	MI: -0.47; SOHE: -0.26	-0.19 (-0.30, -0.08)	F(1,144)=11.2, p=0.001*

Discussion:

The current study showed that a brief, school-embedded Motivational Interviewing (MI) program, reinforced with two short boosters, produced superior improvements in adolescents' oral hygiene compared with Standard Oral Health Education

(SOHE). At 3 months, the MI arm showed greater reductions in OHI-S, Plaque Index and Gingival Index, alongside higher proportions achieving twice-daily brushing, regular night-time brushing, ≥2-minute brushing duration and ≥3-days/week

interdental-aid use. These findings reinforce the premise that how we communicate—by evoking autonomous motivation, resolving ambivalence and planning implementation—can be as important as what we communicate in adolescent oral-health [8]. Two active ingredients likely drove this effect: (1) autonomy support and evocation of "change talk" (desire, ability, reasons, need) that strengthens intention; and (2) implementation planning (time/place/cues/backup) that translates intention into action. These mechanisms mirror findings from caregiver- and child-focused MI studies showing that MI improves hygiene-related knowledge, attitudes and—critically—behaviours that reduce plaque accumulation compared with didactic education. At the synthesis level, Faghihian *et al.* [9] meta-analysis concluded that MI is at least as effective as conventional education for caries-related outcomes but emphasized trial rigor and fidelity as determinants of effect size. Gingival inflammation decreased in both arms but more with MI (adjusted -0.19 ; $p=0.001$). Biologically, this likely reflects (i) improved frequency and duration of brushing (≥ 2 minutes) and (ii) incremental interdental cleaning, both of which reduce plaque retention at the gingival margin. Prior paediatric and caregiver MI studies similarly documented improved soft-tissue health or risk profiles when counselling focused on behaviour enactment rather than information alone [10, 11 and 12]. A ~ 20 -point advantage for ≥ 2 -minute brushing indicates improved quality of execution, not just frequency. MI techniques that clarify "what counts as brushing well" and pair it with timing cues (alarms, checklists) increase adherence to recommended duration. RCTs of child-friendly games and timing prompts report improved brushing practice and time-on-task, complementing MI's motivational pathway [13]. Interdental cleaning increased by ~ 15 points ($NNT \sim 7$). Because this behaviour requires extra tools/skills, uptake depends on confidence building and practical problem-solving—core MI elements. Naidu *et al.* [14] showed that MI reduced risk behaviours by addressing feasibility and self-efficacy in caregivers and systematic reviews highlight MI's ability to

broaden preventive repertoires beyond basic brushing when counselling is individualized.

Conclusion:

Motivational interviewing improved oral-health outcomes and behaviors more effectively than Standard Oral Health Education among secondary-school adolescents. The intervention produced consistent improvements in plaque control, brushing practices and interdental-aid use across gender and grade groups. These findings advance school-based preventive dentistry by supporting brief Motivational Interviewing interventions for adolescent oral health.

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