

Effects of Awareness Intervention Program Regarding Antenatal Care Based on Theory of Planned Behavior on Tribal Women at Reproductive Age Group, West Bengal: Control Trial Longitudinal Study

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Abstract

Substantial inequalities in the utilization of antenatal care (ANC) among tribes and non-tribes are obvious in India. It was a community based longitudinal quasi-experimental study, measured the effect of Theory of Planned Behavior' (TPB) based awareness intervention on ANC. Total 445 tribal women of reproductive age group from West Bengal enrolled through stratified multistage random sampling method out of which 220 participants in control group and 225 were in intervention group. Pre tested structured questionnaire used to collect data. At six months interval two ANC awareness campaign conducted only for experimental group. Data were collected at baseline, midline and endline. Chi-square, independent sample t-test, linear regression analysis, and one-way repeated measure ANOVA used for data analyses. At baseline, there was no statistically difference between control and intervention groups. The participants in intervention group showed significantly better scores after awareness program. Significant effects of intervention within group and between groups analyses for all outcomes were observed with large to small effect sizes. It can be stated that TPB-based intervention program regarding mother health is effective for tribal community.

Key Words: Antenatal care; tribal communities; intervention program; Theory of planned behavior; West Bengal.

Introduction

Many public health threats are deep rooted in human behavior like antenatal care (ANC). Antenatal care is the window of 'thousand days opportunity' for a healthy fetal life and less chances of chronic diseases and other health risks of an adult which means that long-term health is shaped by the condition of pregnancy (Barker et al., 2013). Antenatal care predicts obstetric emergencies, educate women to identify and act on serious conditions, advices for taking healthy nutritious diet, maintaining healthy lifestyle, influence positively for institutional delivery and last but not the least postnatal health care (McNellan et al., 2019).

Premature birth, congenital malformations, intrauterine growth retardation, birth

asphyxia, child mortality and maternal mortality can be stopped by accessing antenatal care from early stage of pregnancy (Fraser, 2013). Over all 78.2% women used ANC services globally. Substantial inequalities in accessing antenatal care services observed specially in Asia and Africa. In Latin America and Europe ANC coverage is almost 90%. More than three-quarters of women of Afghanistan, Somalia and South Sudan remain deprived from ANC services. Africa showed greatest inequalities in ANC utilization (9.4% in Somalia and 99.9% in Libya). Among Asian countries, in Afghanistan ANC utilization is lowest (17.8%). The prevalence of ANC utilization in India is 58.1% (Yaya and Ghose, 2019), out of which Andaman Nicobar

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showed highest 4+ antenatal care visit (83.4%) and Bihar showed the lowest level (25.2%) of coverage. In case of West Bengal, it was 75.8%. From 2015 to 2020 improvement in complete antenatal care visit (4+ visit) and protection against tetanus has seen very less in India. But a good increase (from 30.3 to 44.1%) in consumption of 100 tablets of iron and folic acids has observed (NFHS-5).

Before and after 'Millennium Development Goal' tenure, Government of India launched and implemented a number of Reproductive, Maternal, Newborn Child Plus Adolescent Health (RMNCH+A) Programs. Few of them like Janani Shishu Suraksha Karyakram (JSSK), Pradhan Mantri Matruva Vandana Yojana (PMMVY), and Pradhan Mantri Surakshit Matruva Abhiyan (PMSMA) have specially focused to reduce the margin of inequalities in accessing maternal health care services (Contractor et al., 2018). Disparities in accessing full antenatal care services still obvious among schedule tribes and non-tribes in India (Ali & Chauhan, 2020; Udayar & Parveen, 2019; Adhikari et al., 2016). Low levels of knowledge, different misconceptions, typical perceptions, unaware about the services, strong traditional belief, and fear of inappropriate advice from health workers were the factors for not availing antenatal services (Akhtar et al., 2018; Arya et al., 2017; Mumbare & Rege, 2011). Lack of modern amenities in tribal remote areas also discourages the trained health personnel leads to neglect health services including sub-optimal health promotion activities (Sengupta, 2019).

Previous studies suggested that medical risk regarding antenatal care should be checked by including the non-medical factor-awareness, so that services can be utilized by all community irrespective of economic and educational obstacles in rural areas by

changing behavioral intention (Afaya et al., 2020; Fulpagare et al., 2019; Ogbo et al., 2019; Patel et al., 2016; Alam et al., 2005). One of the effective behaviors change theory in health psychology is the Theory of Planned Behavior (TPB) which is more powerful than Diffusion of Innovation Theory, The Social Cognitive Theory, and Social Norms Theory. TPB model, extended form of Theory of Reasoned Action (TRA) (Ajzen, 2011), used as the base of intervention program to change health related behavior. The TRA model failed to explain the behaviors of an individual had no facultative control over behavior. Hence, perceived behavioral control (PBC) was added with the other antecedents of behavior- attitude, subjective norm and intention in TPB. This social cognitive model hypothesizes that the most proximal predictors of an individual's behavior is the obvious intention to act where intention is the action of personal, social and control realization about target behavior (Ajzen, 1985). According to meta-analytic review, TPB is the most common and frequently used social cognition model in health behavior study. Additionally, it provides empirical support that any health behavior in terms of few constructs can be explained and predict (Hagger et al., 2002; Hausenblas et al., 1997).

Reviews demonstrated that psychological factors of utilizing maternal child health services can be understand through TPB and can provide foundation for intervention design to increase the utilization of MCH services. Some studies carried out in Iran, Tanzania, Ethiopia, United States on the application of TPB in educational intervention in order to promote newborn care in pregnant mother (Navabi et al., 2021), birth preparedness, male involvement, maternal health services utilization (Moshi et al., 2018), preconception care (Setegn, 2021), childbearing intentions (Kariman et al, 2020),

nutritional behaviors preventing anemia during pregnancy (Jeihooni et al., 2021), breastfeeding behaviors after cesarean delivery (Wen et al., 2021), and delivery mode selection (Ghasemi et al., 2017; Besharati et al., 2011) on different social groups. The findings of these studies showed significant statistical differences between two groups' knowledge, attitude, perceived behavioral control, social control beliefs, intention and outcome evaluation. But no such studies carried out on tribal communities in India who are specially obsessed with super natural power and misconceptions. Therefore, it has indicated that educational intervention program based on TPB, such as awareness camp, group discussion, educational sessions for people prompting the individual, family, friends to improvement in antenatal care services utilization of women in case of antenatal care activity of tribal people would have positive effect.

From this context present study designed antenatal care intervention program based on TPB to assess its effectiveness on tribal women of West Bengal in reproductive age group to improve antenatal knowledge, attitude, subjective norms, perceived behavioral control, and intention. The aim of the study was to universalize ANC service utilization in tribal community so that maternal and child mortality and morbidity can be minimized.

Methods and materials

Study design

Present study was community-based control trial longitudinal experiments measured the impact of TPB-based ANC awareness intervention campaign at pre and post intervention phases. Pilot study was done to standardize and validate the self-developed questionnaire. All the key messages of intervention were modified as per societal

need and written up to maintain the coherence of the awareness campaigns. Ethical approval was received. Control and intervention group were selected through stratified multistage random sampling. Intervention applied twice at six months interval. Data was collected at three time points – baseline, time-point 1 (after 1st intervention campaign) and time-point 2 (after 2nd intervention campaign) and analyzed. Only direct variables of TPB were measured and indirect variables were not measured. The study was restricted for three districts due to time limit and financial limit.

Sampling method and sample size

Following the acquisition of informed consent, control and intervention sites were assigned at random. Using a lottery, two villages from each district were assigned to the control group and the remaining two villages to the intervention group. Thus, a total of six villages were selected for the intervention arm and six villages for the control arm. Using a random sampling technique, 40 to 45 households from each village were surveyed. All chosen village's inclusion criteria were followed in order to identify the households, and identification (ID) numbers were assigned based on the addresses of each household. The SPSS program was used to create random numbers. Subsequently, 45 random numbers were chosen from the random number table, matched with the household ID numbers, and surveyed (Ganguly & Ghosh, 2023).

This study used a pre-and post-test quasi-experimental design. The calculation of sample size was done using the formula

$$N = \frac{(Z_{\alpha} + Z_{\beta})^2 \sigma^2}{(\delta)^2} \quad (\text{Bolarinwa, 2020}).$$

The variables N , Z_{β} , Z_{α} , δ , and σ are as follows: N is the number of samples for each arm; Z_{β} is the power (80% probability of

failing to reject Type II error = 0.84); Z_{α} is 95% confidence level (5% probability of Type I error = 1.96), δ is the size of effect (difference between prevalence before intervention, or 21%, and expected prevalence after intervention, or 50%); and σ standard deviation from the pilot study is 1.49. For every arm, the minimum computed sample size was 207. In this study, 230 people were examined for each arm. Following data loss from withdrawal and incomplete information, data from the intervention arm (225 participants) and the control arm (220 subjects) were finally analyzed. Statistical analyses comprised information on 445 participants in total.

Intervention and training program

It is a three years intervention program (2018 to 2021) supported by DST-WOS-B, Govt. of India regarding 'Maternal and Child Health' awareness on tribal community at Jangalmahal through 'Knowledge, Attitude and Practice' (KAP) upgradation. Primary and key component of this program was the TPB-based technical package to improve maternal and child health of tribal community in West Bengal depending on available evidence. A series of strategies accepted and approached through awareness campaigning. Based on Knowledge for Health 2017, present intervention program delivered TPB-based ANC awareness package through group interaction. Each awareness camp lasted for 2-3 hours. First half was spare for elicitation which provided stimuli to encourage the participants to talk about their thoughts, ideas regarding antenatal care services. The goal of elicitation was to find out what the problem needs to be solved according to the verbalize thinking of the participants. Second half time was scheduled for information delivery through lecture, infographic (banner), and related video playing in laptop. Discussion during those

sessions create brain storming and helped the community to take correct decision over their traditional beliefs. Change in knowledge, attitude, subjective norms, perceived behavioral control and intentions were assessed after completion of each awareness campaigning. Present intervention was organized by the team of principal investigator with the support of Accredited Social Health Activists (ASHA)/Anganwadi Worker (AWW). Local administrative support was sought from Community Development Block (CD Block) to run the intervention program smoothly. Intermediate progress reports were communicated to the authorized institution.

Procedure

Baseline: Purpose of the study was explained at community level in front of community health workers. Informed consents were collected from willing participants and all had freedom to leave at any point of time during the study period. Baseline survey conducted on background characteristics questionnaire, past behavior of antenatal care questionnaire, ANC knowledge, attitude towards obstetric pregnancy, perceived subjective norms, perceived behavioral control and intentions questionnaire (identical at all three time-point). Baseline survey was conducted during December 2018 to April 2019.

Time-point 1 - First Intervention/ awareness campaigning: First level intervention awareness campaigning was conducted in selected 6 villages. One awareness camp for one village. Schedule of the campaigning was fixed according to the convenience of the participants. Lecture delivered on key facts of ANC grounded on 'My Safe Motherhood Booklet', MHFW, Govt. of India. Any queries regarding mother and child from audience side were tried to explain in simple manner during discussion session so that their confusion can be cured.

After completion of six camps, survey for time-point 1 was conducted. May 2019 was engaged for organizing all camps and later four months for the survey.

Time-point 2 – Second Intervention/ awareness campaigning: This phase was just the repetition of first level intervention campaigning. October 2019 to February 2020 was scheduled for second phase campaigning program and post survey. After that all data were coded and stored in Microsoft Excel sheet. Before analyses data were imported from excel to SPSS and analyzed.

Data collection tool

A cross-sectional pilot study was conducted on 30 tribal women to modify the structure and content of self-developed questionnaire as per societal need. Standardization of the tool was done by reliability test (Cronbach's alpha value), and content validity test by eight experts in the field of MCH. Finalized questionnaire was applied on small number of women (20) of target study population to understand whether the study tool was capable to measure what is like to measure or not.

Pilot study oriented and societal need-based questionnaire used for data collection. According to TPB, the ANC questionnaire had main 6 segments- background characteristics, knowledge, attitude, perceived subjective norms, perceived behavioral control and intention. Total score of the questionnaire was 110. All were framed in English and then converted into Bengali. Cronbach's alphas, 0.711 for knowledge 0.695 for attitude, 0.713 for subjective norm, 0.717 for perceived behavior control, 0.885 for intention and 0.817 for practice (Table 1).

Study area

Jangalmahal is a tribal pocket in the south west part of West Bengal, mostly under Chota Nagpur plateau having latitude 21° 45' N to 23° 45' N & 85° 45' E to 87° 30' E approximately. Nearly 25-30% of the total population of this region is tribes and West Bengal contribute 5.8% ST population in India (Dan, 2015). Santhal was the most dominated schedule tribes of this region. Many other notable schedule tribes of this region are Bhumij, Savar, Munda, Kheria and Mahali. Tribal people of this region were Maoist affected and have history of deprivation for several hundred years by the exterior rulers. Most of tribes are residing in rural forest areas and are suffering from extreme poverty (living below poverty line) (Dey, 2015; Bhowmick, 1985). Still 21-26% of children of these areas suffer from malnutrition (Dhargupta et al., 2017) and 16.8% teen age pregnancy has seen among tribes (NFHS-5). Present study was conducted in three districts - Purulia, Bankura and Jhargram of Jangalmahal region. From each district two most tribal dense blocks (Bandwan, Manbazar II, Ranibandh, Hirbandh, Binpur II and Gopiballavpur) were selected. Selected villages were on an average 7 to 10 km away from common locality.

Measures

Background characteristics

Background characteristics included in this present study were age, education exposure, occupation, number of children, culture, decision taking power, source of information and antenatal behavior.

Antenatal care knowledge

Knowledge regarding pregnancy care was measure by two items scale had total twenty questions with response format 'Yes', 'No', and 'Don't know'. The two items were advantages of antenatal checkup and

complete antenatal care which include obstetric pregnancy, dietary management during pregnancy and lifestyle management. There are four questions on antenatal care services provided through primary public health system, four questions on obstetric pregnancy, eight questions on dietary management and four questions on lifestyle management during pregnancy (Arya et al., 2017; Lee et al., 2017; Lilungulu et al., 2016; Akhtar et al., 2018; Gupta et al., 2015). 'Yes' was scored 1 and 'No' or 'Don't know' scored as 0. Knowledge score ranged from 0 to 20. At baseline ≥ 11 score was considered as adequate knowledge. Higher score indicating greater knowledge both at baseline and in post intervention phases. Mean knowledge score was used for statistical inferences.

Antenatal care attitude, perceived subjective norms, perceived behavioral control and intention

Attitude, subjective norms and intention all were rated on 5-point Likert scale and perceived behavior control on four-point scale (Kan & Fabrigar, 2017; Ajzen, 2002). Antenatal attitude was measured by individual risk perception and each item started with 'for me' and ended with 'is harmful'. The risk perception was measured by four items scale questionnaire regarding not receiving full ANC checkup (at least 4 visit, TT injections, 100 IFA tablets), not performing physical examination and tests, not taking adequate nutrients and water and not maintaining healthy lifestyle (adequate rest, avoiding smoking and alcohol and hygiene). Levels of agreement rated as extremely disagreed = 1, to neither disagreed nor agreed = 3, to extremely agreed = 5, and score ranges from 1 to 20. At baseline ≥ 11 score was considered as good attitude.

Subjective norms were measured by three items, and questions has been framed to focus on 'family members or neighbors who

are important to the subject were in positive mind for using antenatal checkup from the first trimester' or 'family members or neighbors who are important to subject motivate to consume 100 IFA tablets or complete the TT vaccination'. Levels of agreement rated as extremely disapproved = 1, to extremely approved = 5, and score ranges from 1 to 15. At baseline ≥ 10 score considered as approved mentality.

Perceived behavior control was measure by five items question on perceived ability to perform complete pregnancy care and rated as extremely difficult = 1, to extremely easy = 4, and score ranges from 1 to 20. At baseline ≥ 11 score was considered as easy.

Intention for behavior was measured by three items question and rated as weak intention = 1, to strong intention = 5, and score ranges from 1 to 15. At baseline ≥ 10 score was considered as strong intention.

Antenatal care behavior

Primary measure of antenatal behavior conducted through six items questionnaires regarding the past activity on number of ANC visit completed (4 or < 4 or none), number of consumed IFA tablets (100 or < 100 or none), protected by TT injection (2 or 1 or none), examined and tested mandatory for pregnancy (general obstetric examinations (yes or no), blood pressure (yes or no), body weight (yes or no), anemia (yes or no), fetal growth and movement (yes or no), consumed food and liquid (extra amount of food and liquid than normal condition (yes or no), included all five food groups item like cereals, grains and products (yes or no), pulses and legumes (yes or no), vegetables and fruits (yes or no), milk and product, meat/ fish/ egg (yes or no), and fats, oils, sugar (yes or no) (ICMR Dietary Guideline, 2011) in a whole day meal, maintained healthy lifestyle (taken 8 + 2 hours rest (yes or no), avoided alcohol (yes

or no), smoking (yes or no), avoided heavy work (yes or no). Four antenatal checkup, two TT injections, 100 IFA tablets, all mandatory physical examinations and tests, extra amount of food (at least one food from each five-food group) and liquid consumption, avoidance of alcohol and smoking, avoiding heavy lifting together considered as complete ANC (Ali & Chauhan, 2020; Aziz Ali et al, 2020). Total twenty questions were in the behavior measurement questionnaire. Yes and No were scored as 1 and 0 respectively. Levels of ANC visit, IFA tablet and TT injection were assigned a Likert-type format of highest value scored as 2, intermediate value scored as 1 and none scored as 0. All the scores were summed up and then transformed into dichotomous variable. Maximum score for ANC behavior was 20. All responses were based on mothers' recall of her last pregnancy. Antenatal behavior was measured only at baseline study point.

Statistical analyses

Statistical analysis was performed in SPSS version 22.0 (IBM, New York). An ID number was given to every participant and used for data entry and analysis. Descriptive statistics - frequency, percentage, mean, standard deviation was used to describe the background characteristics of the respondents. Comparison of background characteristics between control group and intervention group of study participants at baseline were done by Pearson Chi-square tests (χ^2) for categorical variables. Independent sample *t*-test done for continuous variables.

Behavior of ANC was used as dependent variable for baseline analysis. Multiple regression analysis was performed to determine the predictor variables for ANC behavior. Effects of awareness intervention program on ANC knowledge and intention

were assessed by one-way repeated measures ANOVA with time (baseline, time-point 1, time-point 2) as within-subjects factor and group (control group and intervention group) as between-subjects factor (Ozoemena et al., 2019). Before conducting repeated measure one-way ANOVA, the assumption tests of homogeneity of variances of the groups in the independent variables through Levene's test, normality of the samples, linearity were performed.

IBM SPSS AMOS 26.0 was used to test hypothesized TPB structural model, whether model was acceptable fit to the present data and also tested the interrelationships specified within the priori augmented model. Chi-square test together with goodness of fit indices; comparative fit index (CFI), root mean square error of approximation (RMSEA) and Tucker Lewis Index (TLI) (Astrom et al., 2018) were observed. There was no missing case in data set. Results were statistically significant at $p < 0.05$.

Results

Background characteristics of respondents

In this present study out of 445 participants, participants were surviving in below poverty line and nearabout 50.3% had no school exposure. Maximum respondents were found multiparous and 50.8% had more than two children. More than 73.9% take their own decision regarding health. Majority of the tribal women engaged in household works (35.7%). Among the rest agricultural labour (29.2%) and collect and sell fire wood (14.8%) and rope making from Babui grass (*Eulaliopsis binate*) (13%) were notable. More than half of the respondents received information regarding pregnancy care from more than one source like local health workers, natives, relatives, or others. Mean age, mean age of marriage and mean

age of first pregnancy of the participants were 26.46 ($SD = 7.86$), 16.77 ($SD = 1.86$), and 18.21 ($SD = 2.28$) years respectively. At baseline, mean knowledge score was 8.78 ($SD = 1.46$), mean attitude was 10.82 ($SD = 1.62$), subjective norms score was 8.47 ($SD = 1.81$), perceived behavior control score was 12.22 ($SD = 2.95$), mean intention score was 11.54 ($SD = 3.35$) and mean practice score 11.24 ($SD = 3.35$). The Chi-square test indicated that there was significant

difference between control and intervention group regarding number of children, occupation and source of information ($p < 0.005$). The independent samples t -test showed no significant differences ($p > 0.005$) on age, age of marriage, age of first pregnancy, baseline practice and also baseline knowledge, perceived behavior control, intention, attitude and between control and intervention group (Table 2, 4).

Table 1 All items in questionnaire used for TPB-based antenatal care intervention program applied on tribal women of Jangalmahal, West Bengal

Questionnaire Items	Total Score	Cronbach's Alpha Value
	110	
Knowledge: No- 0/ Don't know- 0/ Yes- 1		
K1: Antenatal care check-ups help to identify complications of pregnancy- anaemia, preterm labour, preeclampsia, miscarriage		
K2: Complete care of pregnancy- at least 4 ANC check-ups, pathological tests, 100 IFA tablets consumption, 2 TT injections, extra amount of food intake compare to normal physiological condition, adequate rest, foods and drinks to be avoided	20	0.711
Attitude (Risk perception): Definitely not-1/ Probably not-2/ Probably-3/ Very probably-4/ Definitely-5		
A1: Incomplete/ avoiding antenatal check-up, TT injection, 100 IFA tablets	20	0.695
A2: Not performing essential physical examinations and tests		
A3: Inadequate nutrient and water intake		
A4: Inadequate rest, smoking, alcohol consuming		
Subjective norms: Highly disapproved-1/ Disapproved- 2/Neither disapproved nor approved- 3/ Approved- 4/ Highly approved-5		
SN1: Receiving four antenatal visits starts from first trimester	15	0.713
SN2: Taking TT vaccine and IFA tablets		
SN3: Getting all physical examination and pathological tests		
Perceived behavioral control: Definitely difficult-1/ Probably difficult-2/ Probably easy-3/ Definitely easy-4		
PBC1: Attend or receive all 4 antenatal check-ups	20	0.717
PBC2: Getting the body examined, blood and urine test		
PBC3: Complete the course of IFA tablets and TT injection		
PBC4: Consume extra amount of food		
PBC5: Maintain healthy life style- take rest, avoid smoking, avoiding alcohol consumption		
Intention: Not at all-1/ Slightly-2/ Moderately-3/ Very-4/ Extremely-5		
In1: Wish to complete/ attend antenatal check ups	15	0.885
In2: Wish to getting all physical examination and tests		
In3: Wish to take extra amount of food, rest, avoid smoking and drinking alcohol		
Practice No- 0/ Yes- 1		
P1: Number of ANC visit received		
P2: Number of consumed IFA tablets	20	0.817
P3: Number of TT received		
P4: Extra amount of food and adequate rest taken		
P5: Did physical examination and tests		
P6: Avoided smoking and alcohol		

Table 2 Comparison of background characteristics between the control group and intervention group at baseline. All participants were under BPL category. $p < 0.05$ significant.

Characteristics	Group		Total N (%) = 445	χ^2 / t	p
	Control n (%) = 220	Intervention n (%) = 225			
Education exposure					
No school exposure	107 (48.6)	117 (52.0)	224 (50.3)	0.50	0.48
Elementary School exposure	113 (51.4)	108 (48.0)	221 (49.7)		
Number of children					
1-2	116 (52.7)	103 (45.8)	219 (49.2)	2.15	0.14
≥ 3	104 (47.3)	122 (54.2)	226 (50.8)		
Taking decision regarding child health					
Depend on others	65 (29.5)	51 (22.7)	116 (26.1)	2.73	0.09
Own	155 (70.5)	174 (77.3)	329 (73.9)		
Occupation					
Housewife	74 (33.6)	85 (37.8)	159(35.7)	2.17	0.70
Agricultural labour	64 (29.1)	66 (29.3)	130 (29.2)		
Sell fuel wood	35 (15.9)	31 (13.8)	66 (14.8))		
Rope making	28 (12.7)	30 (13.3)	58 (13.0)		
Migrated worker	19 (8.6)	13 (5.8)	32 (7.2)		
Source of information					
No source	56 (25.5)	48 (21.3)	104 (23.4)	3.51	0.17
Single source	116 (52.7)	111 (49.3)	227 (51.0)		
More than one source	48 (21.8)	66 (29.3)	114 (25.6)		
Contraceptive use					
Yes	112 (50.9)	95 (42.2)	207 (46.5)	3.37	0.06
No	108 (49.1)	130 (57.7)	238 (53.5)		
Baseline ANC Practice					
Age (Years) mean \pm SD	11.19 \pm 1.22	11.20 \pm 2.39	0.01 \pm 1.17	1.44	0.16
Age of marriage (Years) mean \pm SD	26.51 \pm 7.45	26.41 \pm 8.25	26.46 \pm 7.86	0.13	0.89
Age of 1st pregnancy (Years) mean \pm SD	16.95 \pm 1.76	16.61 \pm 1.95	16.77 \pm 1.86	1.91	0.06
	18.24 \pm 2.34	18.18 \pm 2.23	18.21 \pm 2.28	0.27	0.78

Predictors of antenatal behavior

Multiple regression model explained about 85.3% of the variability in the outcome variable (adjusted $R^2 = 0.853$). Standard error of the estimate showed that other variables that have not been taken in the model had influence 1.34%. Among the selected independent variables, source of information, baseline knowledge, perceived behavioral control and intention were statistically significant at < 0.05 p -value and considered as predictor variables. The Beta value indicating that intention (0.425) had greater positive influence followed by perceived behavioral control (0.416), source of information (0.162) and baseline knowledge (0.053) on antenatal behavior of tribal women. Other independent variables- age, age of marriage, age of first pregnancy, education, number of children, decision making power, occupation, culture, attitude

and subjective norms were enter in this model were not significantly associated with antenatal behavior ($p > 0.05$).

Structural equation model

In the final model of path analyses, intention and antenatal behavior predicted by exogenous variables like knowledge, attitude, subjective norms, perceived behavior control, was an acceptable fit to data. Model fit statistics indicated χ^2 (2.427, $df = 2$, $N=445$) $p = 0.297$, Comparative Fit Index (CFI) = 1, Tucker Lewis Index (TLI)= 0.99 and Normative Fit Index (NFI) = 0.99, Root Mean Square Error of Approximation (RMSEA) = 0.015 with 90% confidence interval. Standardized regression weight for baseline attitude, subjective norms, perceived behavior control in the prediction of baseline intention was 0.17, 0.15, 0.58, and all were statistically significant ($p < 0.001$).

Table 3 (a, b) Regression analysis for predictors of ANC decision of the study participants (N = 445).

a) Model Summary^b

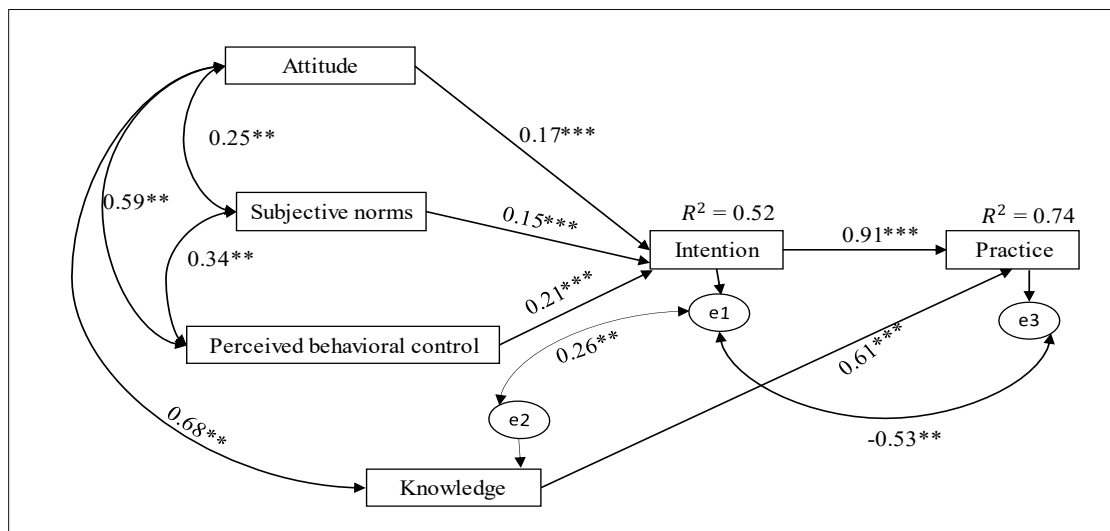
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.924 ^a	0.855	0.853	1.3489	0.855	419.270	14	414	0.000

a. Predictors: (Constant), Baseline intention, Age of Marriage, Culture, Occupation, Education exposure, Number of children, Baseline Attitude, Decision, Baseline Knowledge, Age of 1st Pregnancy, Baseline SN, Age, Baseline PBC, Source of information
 b. Dependent Variable: Baseline Practice

b) Coefficients^a table

Model	Unstandardize	Standardized	t	p	95.0% Confidence Interval for B	Unstandardize	Standardized
	d Coefficients	Coefficients				d Coefficients	Coefficients
	B	Std. Error	Beta			B	Std. Error
(Constant)	-2.625	0.604		-4.343	0.000	-3.811	-1.439
Age	0.009	0.006	0.026	1.630	0.103	-0.002	0.020
Education exposure	-0.030	.110	-0.004	-0.274	0.784	-0.247	0.186
Age of marriage	-0.027	0.026	-0.016	-1.030	0.303	-0.078	0.024
Age of 1 st pregnancy	-0.010	0.025	-0.006	-0.404	0.686	-0.060	0.039
Number of children	-0.068	0.093	-0.010	-0.739	0.460	-0.250	0.113
Decision making power	-0.012	0.106	-0.001	-0.110	0.912	-0.219	0.196
Occupation	0.027	0.030	0.011	0.892	0.373	-0.033	0.087
Source of information	1.150	0.163	0.162	7.057	0.000	0.830	1.470
Baseline Knowledge	0.127	0.034	0.053	3.800	0.000	0.062	0.193
Baseline Attitude	0.041	0.034	0.019	1.184	0.237	-0.027	0.109
Baseline SN	-0.034	0.032	-0.017	-1.061	0.289	-0.096	0.028
Baseline PBC	0.494	0.020	0.416	24.730	0.000	0.455	0.534
Baseline intention	0.444	0.024	0.425	18.711	0.000	0.398	0.491

a. Dependent Variable: Baseline Practice
 SN. Subjective norms, PBC. Perceived behavioral control



CMIN/DF = 2.427, DF = 2, p = 0.297, CFI = 1, TLI = 0.999, RMSEA = 0.015
 Where CMIN/DF, Chi-square fit index/Degree of freedom; CFI, Comparative Fit Index; TLI, Tucker Lewis Index; RMSEA, Root Mean Square Error of Approximation.
 SN, Subjective norms; PBC, Perceived behavioral control.
 *** p < 0.001; ** p < 0.01

↔ Correlation → Direct relationship

Figure 1 Final structural equation model (standardized estimation) for antenatal practice at baseline for tribal women

Standardized regression weight for baseline intention and knowledge in the prediction of antenatal baseline practice were 0.91 ($p < 0.001$) and 0.06 ($p = 0.010$) respectively.

The regression weight for subjective norm for knowledge was 0.15 ($p < 0.001$). The correlation between exogenous variables were all statistically significant. The estimated correlations between attitude and perceived behavior control, subjective norm and perceived behavior control, attitude and subjective norm were 0.25, 0.34 and 0.56 respectively. All items used in these analyses were significant in measuring the factor showed antenatal practice was accurately measured (Figure 1).

Intervention impact on maternal knowledge, attitude, change, subjective norms, perceived behavioral control, intention

After intervention, significant differences ($p < 0.05$) were observed between intervention and control group in the mean scores of knowledges, attitude, subjective norms, perceived behavioral control and intention.

Mean knowledge score at post phase of intervention time-point 2 for intervention group was 13.164 ($SD = 2.27$) and for control group was 10.740 ($SD = 1.75$). In case of attitude at the end of program intervention group scored 16.922 ($SD = 1.63$), whereas control group showed 13.242 ($SD = 3.16$) score. Subjective norm score for intervention and control group at time-point 2 was 10.320 ($SD = 1.42$), 10.009 ($SD = 1.58$) correspondingly. Intervention group had perceived behavioral control at the end point was 16.460 ($SD = 2.64$), whereas in control group score was 14.123 ($SD = 2.98$). Intention score for both intervention group and control group after final intervention campaigning were correspondingly 12.899 ($SD = 3.39$) and 11.804 ($SD = 2.96$) (Table 4).

Repeated measure one-way ANOVA explain the effect of intervention on antenatal care. Tests of within-subjects contracts table allows us to assess the type of trending over time of intervention irrespective of group membership.

Table 4 Mean (SD) scores of ANC knowledge, attitude, subjective norms, perceived behavioral control, and intention among the study participants at pre (baseline) and post phase of intervention (time-point 2). $p < 0.05$ was considered as significant difference. N = 445, control (n) = 220, intervention (n) = 225.

Measures	Baseline Mean \pm SD	p	Time-point 1 Mean \pm SD	p	Time-point 2 Mean \pm SD	p
<i>Knowledge</i>						
Control group	8.689 \pm 1.56	0.173	9.434 \pm 1.48	0.001	10.740 \pm 1.75	0.000
Intervention group	8.805 \pm 1.43		10.894 \pm 1.76		13.164 \pm 2.27	
<i>Attitude</i>						
Control group	10.708 \pm 1.52	0.240	11.265 \pm 1.73	0.001	13.242 \pm 3.16	0.000
Intervention group	10.854 \pm 1.65		13.974 \pm 1.92		16.922 \pm 1.63	
<i>Subjective norms</i>						
Control group	8.438 \pm 1.62	0.709	9.046 \pm 1.58	0.035	10.009 \pm 1.58	0.005
Intervention group	8.486 \pm 1.86		9.341 \pm 1.61		10.320 \pm 1.42	
<i>PBC</i>						
Control group	12.219 \pm 2.29	0.958	12.826 \pm 2.95	0.001	14.123 \pm 2.98	0.000
Intervention group	12.229 \pm 3.11		14.662 \pm 2.76		16.460 \pm 2.64	
<i>Intention</i>						
Control group	11.333 \pm 3.22	0.270	11.749 \pm 2.96	0.052	11.804 \pm 2.96	0.000
Intervention group	11.608 \pm 3.39		12.195 \pm 3.13		12.899 \pm 2.78	

Main effect of time of intervention had statistically significant effects for knowledge [F(1, 443) = 872.65, $p < 0.001$, $\eta^2 = 0.633$], attitude [F(1, 443) = 1119.16, $p < 0.001$, $\eta^2 = 0.689$], subjective norms [F(1, 443) = 425.048, $p < 0.001$, $\eta^2 = 0.457$], perceived behavioral control [F(1, 443) = 442.482, $p < 0.001$, $\eta^2 = 0.412$] and intention [F(1, 443) = 113.658, $p < 0.001$, $\eta^2 = 0.184$]. All the eta-squared value indicated very large effect while intention showed quiet smaller effect than others.

The interaction effect of time and group also showed significant effects for knowledge [F(1, 443) = 142.209, $p < 0.001$, $\eta^2 = 0.220$], attitude [F(1, 443) = 222.770, $p < 0.001$, $\eta^2 = 0.306$], subjective norms [F(1, 443) = 4.732, $p < 0.001$, $\eta^2 = 0.009$], perceived behavioral control [F(1, 443) = 101.708, $p < 0.001$, $\eta^2 = 0.168$] and intention [F(1, 443) = 20.076, $p < 0.001$, $\eta^2 = 0.038$]. The eta-squared value of

knowledge, attitude and perceived behavioral control had larger effect while subjective norms and intention had smaller effect size (Table 5). This was further suggested by profile plot of the means (Figure 2).

The tests of between-groups effects showed statistically significant effects the main effects for knowledge [F(1, 443) = 173.49, $p < 0.001$, $\eta^2 = 0.146$], attitude [F(1, 443) = 458.02, $p < 0.001$, $\eta^2 = 0.312$], subjective norms [F(1, 443) = 4.00, $p < 0.001$, $\eta^2 = 0.004$], perceived behavioral control [F(1, 443) = 13.91, $p < 0.001$, $\eta^2 = 0.014$], and intention [F(1, 443) = 15.35, $p < 0.001$, $\eta^2 = 0.015$]. The eta-squared value of knowledge and attitude had larger effect and perceived behavioral, subjective norms and intention had smaller effect size (Table 6).

Table 5 Repeated-measure ANOVAs showed intervention effects on antenatal care knowledge, attitude, subjective norms, perceived behavior control and intention (within-subjects effects: time and time X group), N = 445, control (n)= 220, intervention (n)= 225. $p < 0.05$ was considered as significant difference

Measures	F (Time)	η^2	F (Time X Group)	η^2
<i>Knowledge</i>				
Control group	872.65*	0.633	142.209*	0.220
Intervention group				
<i>Attitude</i>				
Control group	1119.16*	0.689	222.770*	0.306
Intervention group				
<i>Subjective norms</i>				
Control group	425.048*	0.457	4.732*	0.009
Intervention group				
<i>PBC</i>				
Control group	442.482*	0.412	101.708*	0.168
Intervention group				
<i>Intention</i>				
Control group	113.658*	0.184	20.076*	0.038
Intervention group				

PBC Perceived behavioral control, F Wilks' lambda F value, $df = 1, 443$, η^2 Partial Eta squared, * $p < 0.0001$

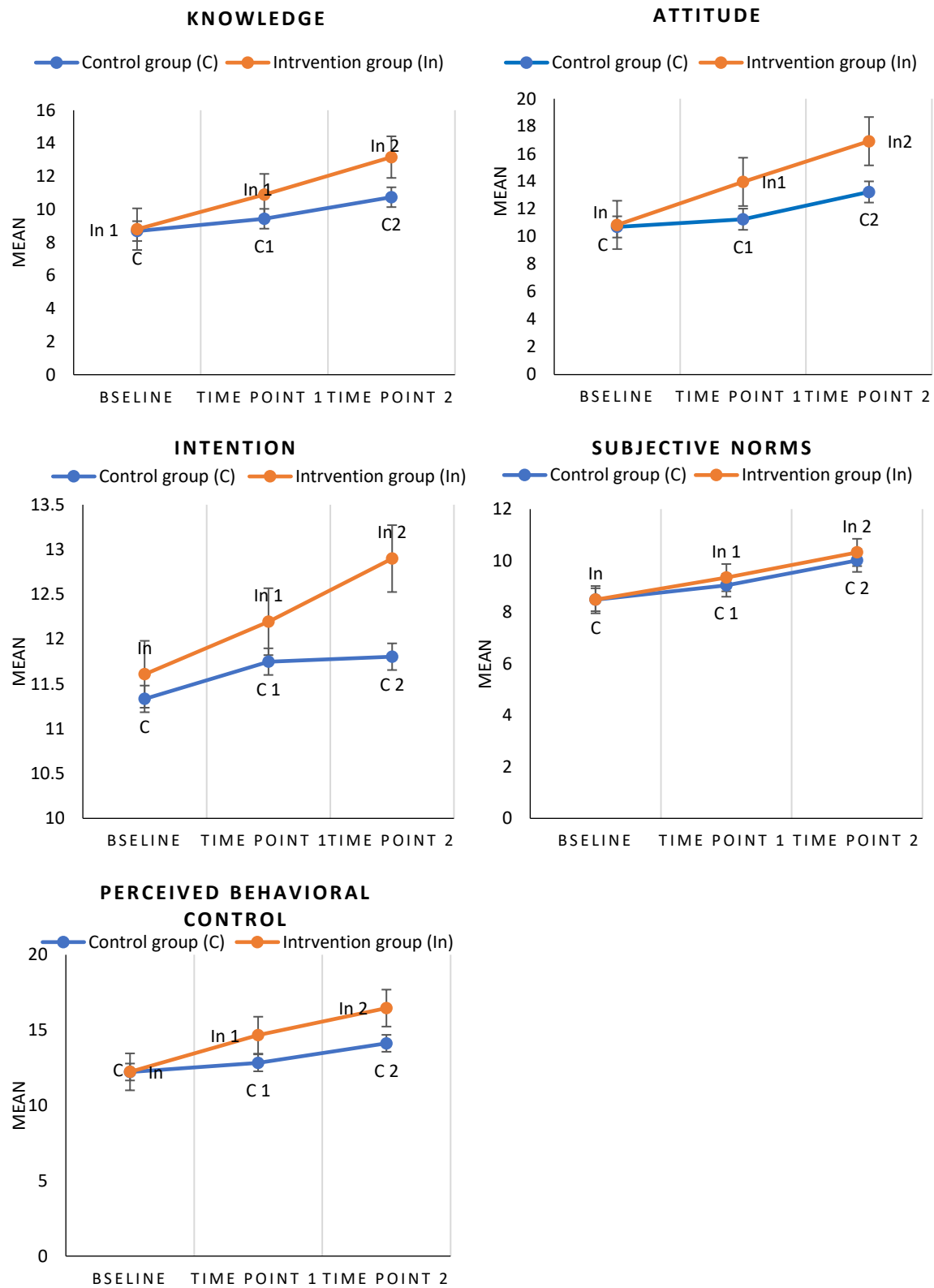


Figure 2 Inferences between and within groups. Means and standard error bars for the effect of intervention where the mean scores of control group and intervention group measured at in three time point. Error bars can be used to assess differences between groups at the same time point by using an overlap rule to estimate p for C vs. In. Error bars shown here not be used to assess within group comparison (change from In to In2 or C to C2).

Table 6 Repeated-measure ANOVAs showed intervention effects on antenatal care knowledge, attitude, subjective norms, perceived behavior control and intention (between-subjects effects: groups), N = 445. $p < 0.05$ was considered as significant difference.

Measures	Estimated Marginal Means		Mean Difference (I-J)	Std. Error	F	η^2
	Control Group	Intervention Group				
Knowledge	9.621	10.954	-1.333*	0.104	165.768*	0.141
Attitude	11.738	13.916	-2.178*	0.104	437.163*	0.302
Subjective norms	9.164	9.382	-0.218*	0.112	3.787**	0.004
PBC	13.056	14.450	-1.394*	0.194	51.606*	0.049
Intention	11.629	12.234	-0.606*	0.228	7.035**	0.007

η^2 Eta squared, Adjustment for multiple comparisons: Bonferroni, *. $p < 0.0001$, **. $p \leq 0.05$.

Discussion

Baseline finding of this study showed mean score of pregnancy care knowledge, attitude, perceived behavior control and intention levels were low in tribal women and were found as predictor factors for maternal services utilization. All variables score in TPB model differed between intervention group and control group after time-point 2 intervention, which indicated that awareness campaigning on ANC has influenced knowledge, attitude, subjective norm, perceived behavioral control and intention of intervention group. Influential difference on subjective norm and intention were less between the groups, but large influence has seen in knowledge and attitude and perceived behavioral control.

Since ANC knowledge improved in large extent in intervention group women compare to the stage before the campaign and control group, it can be concluded that planned awareness campaign has been largely effective in improving tribal women's knowledge who are basically uneducated or very minimum educational exposure. Another study aimed to investigate the educational intervention effect about prenatal care on marriage candidate girls found significant improvement in knowledge and attitude levels (Mahamed et al., 2012). This result was also suggested by another health education study on childbearing among women of

Taiwan (Wang et al., 2012) and Tehran (Kariman et al., 2020).

Effect of educational intervention on attitude change has seen in many studies like choosing delivery mode place (Ghasemi et al., 2017), prevention of iron deficiency anemia in pregnant women (Jeihooni et al., 2021), using multivitamin supplement (Pawlak et al., 2008). In this present study significant improvement in attitude levels among intervention group also corroborate that attitude can be changed by awareness intervention program.

For behavioral intention positive subjective norms are considered as the important predictors where an individual believes that people close to them approve and motivate to meet the action. Present intervention program increased the mean scores of subjective norms in intervention group from baseline to time-point 2. In this study, Tribal women's give preference to their family (husband / mother-in-law/ mother), friends, relatives or community members for antenatal checkup or consuming IFA tablets or taking TT injections and other services. Other studies also showed that for infant feeding or selecting delivery mode or consuming supplementation during pregnancy women gave importance to her husband and mother-in-law or mother (Wen et al., 2021; Jeihooni et al., 2021). Involvement of family members in ANC was obvious and influence of the society (friends, relatives)

was also observed in this study as stated in the study conducted on fertility intention in Romania (Caplescu, 2014). What other mother do during their pregnancy had also great impact on tribal women which might be the reason for small effect size of intervention on subjective norms and indicate strong societal influence in utilizing modern health amenities. But in other studies that had used TPB to change sexual behaviors in postmenopausal women had no effects on subjective norms (Jalambadani et al., 2017).

Perceived behavioral control, considered as third intention controlling factor in TPB, is the individuals understanding about comfort or difficulty of doing a behavior, his/her external and internal limitations or realization of resources, skill and opportunities required to accomplish the behavior (Ajzen, 1991). In the present study mean score of PBC increased in intervention group from baseline to end point of intervention than control group. The intervention effect size was also large which support that awareness program had influence on perceived behavioral control. Because educational intervention helped an individual to understand the actual barriers, hardships, resources or her potential to do the action (Kariman et al., 2020).

Present finding of the study showed behavioral intention regarding ANC of tribal women in the intervention group has changed after time-point 2 which suggests positive effects of intervention program. Number of studies also found positive effect of TPB-based educational intervention program on behavioral intention (Kariman et al., 2020; Giles et al., 2015). Small effect size of intervention on intention of ANC among the tribal women might be frequency of campaign was insufficient to change in

strong intention to use complete ANC services in the present study.

The weakness of the study was the limitation of sampling only in three districts of West Bengal and therefore the results cannot be generalized for all the tribal communities in India. The study also failed to measure indirect variables of TPB. Another limitation was vast inclusion criteria (many of the participants already pass-through child bearing phase) and therefore antenatal behavior cannot be measured after intervention. Last but not the least, present study has not conducted any follow-up studies to measure the sustainability of the ANC intervention effect on tribal women.

No TPB-based intervention study has conducted on tribal community regarding ANC behavior. The study suggests that TPB model is useful for changing behavioral intention of a population even who are shrouded with superstition and myth. The major success of this present study was the improvement of antenatal care intention to utilize ANC services. The elicitation study is another strength of this study for the upliftment of tribal community who had history of hundred years of deprivation. Present study suggests that repeated intervention and elicitation study is required with the collaboration of educational research institution and Government so that the intervention can be applied on large number of populations. The study also suggested to include both direct and indirect variables of TPB measurements to identify specific determinants that could be targeted for behavior change for utilization of health care services among tribal women. Long term follow-up studies are also required for the application of TPB model in institutional delivery, vaccination, health check-up, growth monitoring and health care services

utilization for people at a specific time and place.

Conclusion

The study focuses the necessity of TPB-based behavior change interventions for societal modification because everyone's belief and behavior are connected by TPB. In this concern TPB model is involved for improving intention of ANC service utilization by the backward community as almost desired results have been achieved without imposition of any unfavorable consequences. Environmental or economic factors, which are changing overtime and influence a person's intention and behavior, which are not addressed in the present study would be considered in the extended part of this study. Involvement of ASHA or Anganwadi worker is mostly required for continuous dissemination of messages after the completion of health intervention programs for such vulnerable communities to focus the commitments of the government has made for the *SDG-3* agenda.

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Data availability statement

The de-identified data that support the findings of this study are available from the corresponding author, upon reasonable request.

Disclosure statement

No potential conflict of interest was reported by author(s).

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