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WATER AND SANITATION, HYGIENE (WASH) PRACTICES IN INTERVENED AND NON-INTERVENED COMMUNITIES AND ITS IMPACTS ON CHILD HEALTH & SUSTAINABLE COMMUNITY DEVELOPMENT: A STUDY OF DISTRICT, GUJRAT, PAKISTAN

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Keywords

Behaviour Change Interventions, Sustainable Community Development, Stratified Random Sampling, Knowledge, Attitude, And Practice, Water and Sanitation, Hygiene.

Abstract

Naturally, individuals have developed long held habits, which inclined by their socio-cultural, economic, educational and religious aspects of life. These long held habits are based on their knowledge attitude and practices regarding various aspects of life and contribute a lot in their wellbeing. Careless behavior, poor knowledge & practice regarding water and sanitation, hygiene (WASH) are one among the most imperative causes for spreading diseases and creates unbearable socio-economic burden on communities. Unsafe water and sanitation, hygiene practices are the major obstacle and largest hindrance towards child health and sustainable community development. The complexities of communities are multilayered and cannot be addressed with single approach, but need integrated interventions at community level. In this context, the study examines the role of WASH practices in intervened and non-intervened communities of district Gujrat, Pakistan. The primary data was collected from district Gujrat (Pakistan) through stratified random sampling. The hypotheses were tested with smart PLS-3. Findings revealed that the behaviour change interventions in communities regarding WASH have significant impacts on child health and sustainable community development.

1. Introduction

Human nature has never been static from the time of conception to the time of death and a number of psychological, physical and social changes are always undergoing (Ghosh *et al*., 2021). Naturally, individuals have developed long held habits, which are inclined by their socio-cultural, economic, educational and religious aspects of life. These long held habits are based on their knowledge, attitude and practices regarding various aspects of life and contribute a lot in their wellbeing (Abuzerr *et al*., 2020). Careless behavior, poor knowledge & practice in daily life, regarding water and sanitation, hygiene (WASH) are the most imperative causes for spreading diseases among communities and create unbearable socio-economic burden. Unsafe water and sanitation, hygiene practices are the major obstacle and largest hindrance towards sustainable development of health and wellbeing of individuals (Kapsalis *et al*., 2020). Inadequate access to safe drinking water combined with meager sanitation and unsafe hygienic practices have detrimentally impacted the health of individuals especially children. In developing countries like Pakistan, poor WASH practices expose a plethora of infectious diseases that incapacitate individuals and reduce their productivity (Kumwenda, 2019). Although Pakistan has shown some progress in recent decades, the country still remains plagued by extremely low levels of water, sanitation and hygiene conditions. Nearly 25 million individuals do not have access to basic facilities of drinking water (WHO, 2020) which negatively impacts physical and cognitive growth (WHO, 2017). Pakistan is among the top three countries, where high incidences of child mortality and morbidity are reported annually. Less than five mortality rate is 74 deaths per 1000 live births. This means that approximately one in every 14 children in Pakistan do not survive to their fifth birthday (Moreno *et al.*, 2020). However, this irreversible loss of young lives could be reduced or saved every year if individuals and families have awareness, improved knowledge, attitude, practice and behavior regarding WASH (Cooper, 2019). Nearly all of the most pressing community development issues could be prevented or improved if individuals change their behavior in everyday life (Sands *et al*., 2021). Behavior change is a necessary component for enhancement of an individual's life as well as for the attainment of sustainable development in communities (Saroj *et al*., 2020). In recent decades, interventions for behavior change have been applied at large scale in less developed countries in context to changing their behavior and for effectiveness of sustainable development programs in the communities (World Bank, 2017). In this age of globalization, effective behavior change interventions with intent to cope with the complexities of the communities are essential. Effectual integrated behavior change interventions require expert knowledge of socio-cultural conditions, available resources, context sensitiveness of various aspects and realities that shape the lives of people. This also encourages and molds certain behaviors of individuals, families and communities related to their social, cognitive and physical health. Therefore, it is of major

concern in this study to do a comprehensive analysis of integrated behavior change intervention regarding WASH and its impact on sustainable community development (Saaka *et al*., 2021). Integrated behavior change interventions are a set of activities in communities which are intentionally designed to enhance the process of changing behavior with regard to specific aspects (Cooper, 2019). It can be focused at various levels; as macro & micro-environmental, interpersonal (families and social network), community (neighborhoods), institutional (schools and employers) and policy (law and regulation) level (Talmage, 2021). The concept of integrated intervention engages not only the multi sectoral nature of behavior but also includes the broad range of actors involved in the process (Ochu *et al*., 2021). The holistic initiatives in development sector are not a new phenomenon and changing behavior is among the basic components of development (Pradhan *et al*., 2020). Most of the behavior change interventions aim to promote the lives of individual through changes in their way of living that is more suitable to their community environment. Some interventions try to change behaviors by actively engaging participants using a variety of interactive and participatory initiatives, providing context sensitivity counseling regarding their traditions, norms, values and socio-economic aspects (Ross *et al*., 2021). Inspite of awareness regarding positive behavior and improved knowledge of health care, huge portion of world's population practices and habits has been strikingly inappropriate (Weston *et al*., 2020). In industrialized countries, most of the people have access to improved knowledge and services, whereas in most of the under developing nations, about half or less than half have access to these improved facilities. World Health Organization reveals that every year more people die due to unsafe health behaviors than lack of medication and care (WHO, 2020). Behavioral risk aspects are one among the leading causes for existence and prevalence of high rates of mortality and morbidity in the world. The burdens of chronic, infectious and parasitic diseases are preventable with improved knowledge, practices and changed behavior of individuals (WHO, 2020). To understand the complex and multidimensional nature of relationships among determinants of behavior regarding health, wellbeing of individuals and sustainable community development, there is a need for integrated interventions (Samuel *et al*., 2019). However, change in behavior is a complex and multidimensional process as it requires special attention and integrated interventions (Brewis *et al*., 2020). Behavior change is wildly manifested by the application of various methods and techniques as communication for development (CFD), Behavior Change Communication (BCC), water and sanitation, hygiene (WASH) and open defecation free (ODF) programs among many others (Samuel *et al*., 2019). Health behavior is a complex variable, influenced not only by knowledge and education, but various multi-level factors. The interventions for changing individual health behavior there is need to broaden their focus beyond health and nutrition education (Deslatte *et al*., 2019). Integrated behavior change interventions include factors such as maternal autonomy within the household, the perceptions

and attitudes of the family towards their health status (Domini *et al*., 2020).

1.1 Integrated behavior change interventions regarding WASH, Pakistan

Pakistan hosted the second South Asia conference on sanitation (SACOSAN II) in 2006, which brought the agenda regarding sanitation on a national level, and the national sanitation policy was formulated by the federal government in 2006. Pakistan national sanitation policy provides a broad guideline to the federal and provincial governments to enhance sanitation coverage in the country. Policy strongly recommended the formulation of strategies at all respective levels to improve the environment, quality of life, health and overall wellbeing. Behavior change and social mobilization is the key component to address the sanitation issue at household level especially in rural areas. The policy envisions creation of a hygienic environment with safe management of solid and liquid waste. It also encourages and promotes health and hygiene practices through various behavior change interventions in the country. On the basis of national sanitation policy broad guidelines are provided to all provincial governments, administrative authorities, development authorities and local governments to enhance coverage and formulate specific strategies, programmes and action plans. Furthermore, in 2008 the government of Pakistan notified a core group regarding community led total sanitation (CLTS). The prime stakeholders as water and sanitation program south Asia (WSP-SA), united nation international children emergency funds (UNICEF), WaterAid, rural support programmes network (RSPN), Pakistan institute for environmental development action research (PIEDAR) and plan Pakistan, was assigned the responsibilities to chair the whole group. In accordance with the implementation of the above policy many interventions were adopted by the provincial governments according to the nature of their local context. Similarly, the public health engineering department (community development unit) from the government of Punjab and UNICEF designed comprehensive planning, implementation, promotion, regulation, monitoring and evaluation designed to carry out behavior change interventions in rural and urban areas of Punjab province. The government of Punjab and UNICEF carried out the behavior change programme with the title "scaling up Pakistan approach to total sanitation (PATS) open defecation free (ODF) programme". Behavior change intervention of this programme was carried out by the community development unit, of the public health and engineering department in all 36 districts of Punjab. The programme targets the rural communities with intentions to achieve and sustain an open defecation free environment, with clear emphasis towards individual's behavior change and social mobilization enhancing the need of safe water and sanitation, hygiene. This programme endorses the use of numerous behavior change interventions, have significant impacts on communities as school led total sanitation (SLTS), community led total sanitation (SLTS), behavior change communication complains (BCC), sanitation marketing, information, education and communications (IEC), community participation

and component sharing among others. WASH program in district Gujrat was designed keeping in view the open defecation free (ODF) ratio (6%) and target to achieve 100% ODF free status. District Gujrat, the universe of the present study is situated on the bank of Chenab river by the east and southeast sides with a population of 27, 56,289. Out of total 31% is living in urban areas and 69% belongs to rural areas with 2.10% growth rate (WHO, 2020). For the purpose of WASH awareness programme (Pakistan approach to total sanitation) and according to the policy of government, initially 27 union councils (280 villages) were selected from behavior change interventions in rural areas of district Gujrat in July 2018. Community development unit (CDU) of the public health engineering department approached each village for the formation of village WASH coordination committee (V-WASH-CC) and which were comprised of the key person of that community. The whole activities in the selected villages were performed with the consultation and coordination of V-WASH-CC. Comprehensive awareness session regarding water and sanitation, hygiene and its relationship with human health was conducted with the men and women of each Mohallah. These behavior change awareness sessions consisted of various components such as IEC materials, village mapping activities, glass demo, shit calculations, flow charts among many others. Similarly, all types of public and private schools, madrasas, community centers were also involved and school WASH clubs were established. Detailed awareness sessions regarding personal and environmental hygiene were conducted with school children. Selected villages and communities were engaged for the period of one year and behavior change interventions were carried out continually with men, women, elders and children. UNICEF published a report on the achievements during this period and revealed that these behavior change interventions have special impacts on these communities and also other cross-cutting issues such as individual's health especially on the health of children under five (Hardeman *et al.*, 2019). Integrated behavior change interventions at community level play a vital role in enhancing individual knowledge and practices, and change their long held habits with regard to improved WASH practices. Without better understanding of complexities and importance of the issue, implementation of behavior change interventions, desired results may be thwarted. Keeping in mind the above scenario, it can be assumed that individuals and families participating in behavior change interventions have significantly better understanding regarding safe WASH practices. Therefore, an in-depth evaluation is carried out to know the difference regarding water and sanitation, hygiene (WASH) practices in intervened and non-intervened communities.

1.2 Objectives

1. To assess the existing WASH situation and knowledge of individuals in the intervened and non-intervened communities.
2. To examine the difference of Knowledge, attitude and practices regarding WASH in intervened and non-intervened communities.

2. Theoretical Framework of the Study

Behavior change interventions are typically complex and involve many interacting components. The development, implementation and evaluation of effective behavior change interventions are fundamental for advancing behavioral science and its application. However, both the theory and practice of interventions depend on having a good understanding of the nature and content. A comprehensive integrated behavior change model for water and sanitation, hygiene (IBM-WASH) was established by Martin Fishbein and his colleague Icek Ajzen. Integrated behavior model for water and sanitation, hygiene (IBM-WASH) is the combination of the Theory of Planned Behavior (TPB) and the Theory of Reasoned Action (TRA) (Afzal *et al.,* 2022).

2.1 Integrated Behavior Model for Water and Sanitation, Hygiene (IBM-WASH)

Integrated Behavior Model for Water and Sanitation, Hygiene (IBM-WASH) was established to deal with the factors affecting water and sanitation, hygiene (WASH) at various levels as individual, group and community. This behavior change model is regarding WASH practices at household or community settings, rather than in private or institutional (hospitals, clinics etc.) settings. In this study, the researcher tries to apply a comprehensive theoretical framework for examining the integrated behavior change interventions for sustainable community development in the context of an individual's knowledge, attitude and practices regarding WASH. The IBM-WASH model provides synthesis of various available frameworks and models. This model is available in the form of matrix, with five levels (rows) and three dimensions (columns). The three intersecting dimensions of this behavior change model have significant influence on behavior regarding WASH. The dimensions of the framework are contextual, psycho-social and technological which provide the basics understanding with regard to different levels (Afzal *et al.,* 2022).

2.2 Contextual Dimension of IBM-WASH Model

Contextual dimensions of integrated behavior model for water and sanitation, hygiene provide understanding regarding background characteristics of individuals, communities and environment. These characteristics have significant association with intentions of activities and formulate specific behavior. These consist of socio-economic and geographical aspects along with access to products, markets and ability to utilize resources. The contextual dimensions of the model include many determinants of societal or structure level which is well summarized in water and sanitation, hygiene (WASH) index. At the societal or structure level, multidimensional tools for integrated thematic analysis of community development and WASH approaches are linked with the development perspective of policy. At the individual level, determinants covered in the contextual dimension are basic or background aspects.

Table 1: The integrated behavior model for water and sanitation, hygiene (IBM-WASH)

Levels	Contextual dimension	Psychosocial Dimension	Technological dimension
Societal or structural	Policy, regulation, geography and climate	Culture, identity and leadership	National policies, financing, production and promotion of products
Community	Market & resource access and physical environment	Social integration, efficacy and stigmatization	Availability, location, access and products maintenance
Household or interpersonal	Role & responsibilities household structure, available space and division of labor	Aspiration, nature, shame and descriptive & norms	Demonstration for use, modeling and access
Individual	Education, employment, wealth, livelihood, gender and age	Knowledge, self-efficacy, perceived threat and disgust	Strengths and weaknesses, costs And convenience
Habitual level	Habit formation, favorable environment, opportunities to repetition of behavior	Income, expenditure and habits regarding water & sanitation	Efficiency and effectiveness of products use

2.3 Psycho-social Dimension of IBM-WASH Model

The psycho-social dimension of the model has been described through different ways in the framework as health belief model (HBM) or social cognitive theory (CT) among others. This dimension of WASH model comprises various factors that promote activities of intervention regarding behavior change and habit development. The psychosocial dimension of the operational model or framework refers to behavior determinants of individuals and communities. It becomes the intermediate factor that leads to the behavior change interventions and outcomes (Hardeman *et al*., 2019). The dimension refers to the psychological and social aspects and its related determinants, which have impacts on establishing and molding behavior. This dimension also presents many other ways to manage the psychological aspects and social norms and ensure maximum desired results of the IBM-WASH model (Mosler, 2010).

2.4 Technological dimension of IBM-WASH Model

The technological dimension of integrated behavior model for water and sanitation, hygiene deals with the access and utilization of modern facilities and advanced technologies in WASH sector. New technological interventions have strong associations with the behaviors of individuals and can make life easier and comfortable. Existing WASH conditions and practice is a simple type of action or practice normally performed at household or community level. Now even simple hand washing can require some kind of physical product or technical component and the presence of this technical instrument can have significant impact on individual behavioral outcomes. Availability of sufficient facilities as hand washing points with soap and water at convenient locations can

improve the involvement of inhabitants in hand washing practices at critical times. As a community level chlorine dispenser is one of the best examples for behavior change and adoption of new technologies in WASH sector.

2.5 Conceptual Framework of the Study

The study considered the following variables as knowledge, attitude and practice (KAP), water and sanitation, hygiene (WASH), child health (CH) and integrated behavior change interventions (IBCI). As such, interlinked relationships among, all considered variables are explained in true spirit, hypothesized the impacts, and also presented coherently. Integrated behavior change interventions are considered as one of the most important driving factors of social, economic and environmental development in communities and also a fundamental aspect to enhance individual health and overall wellbeing. Adequate knowledge, attitude & practice (KAP) of individuals, families and communities regarding water and sanitation, hygiene (WASH) can change the behavior and have significant impacts on health and can reduce the vicious cycle of waterborne diseases by interrupting the transmission route of pathogens and infections. These improvements in avoidable health issues through behavior change can lead to reduced morbidity, mortality and socio-economic burdens of families and communities (Afzal *et al.*, 2022).

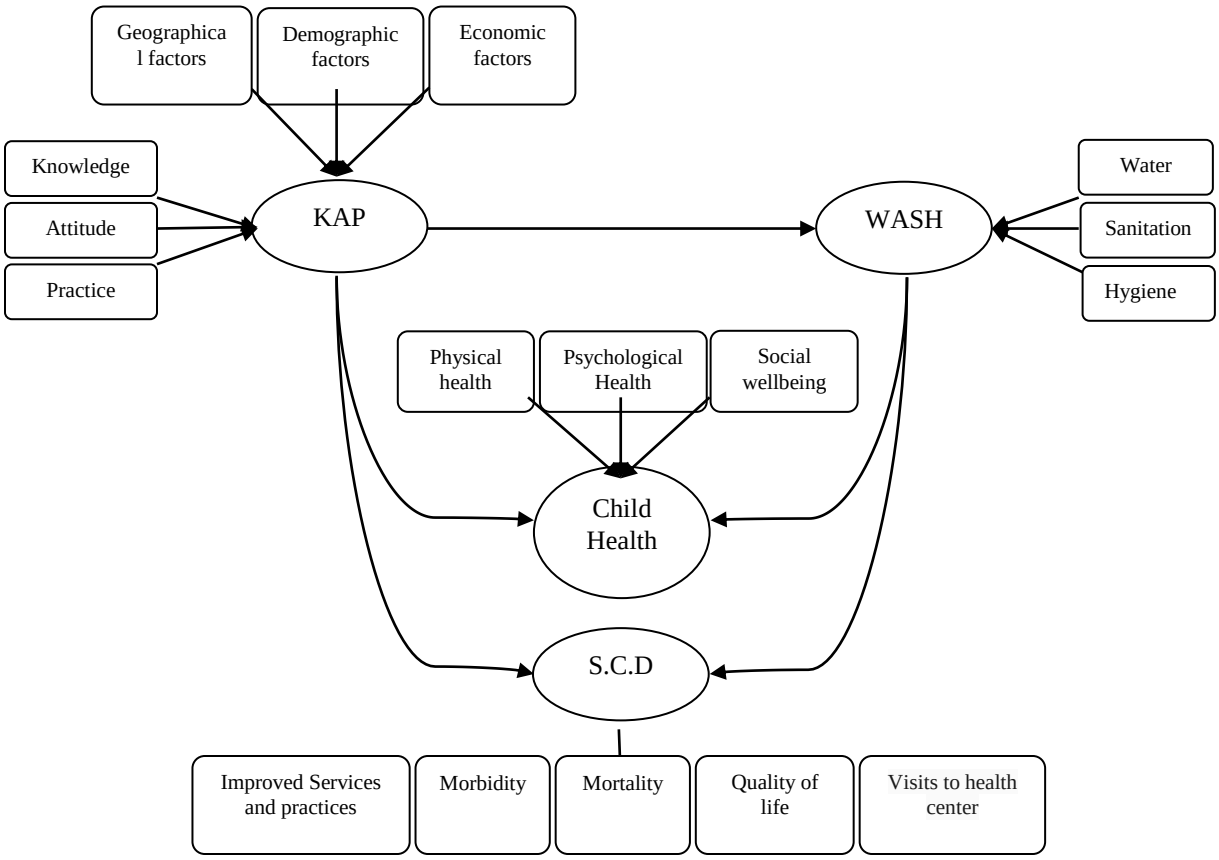


Figure 01: Conceptual framework of the study

3. Hypotheses

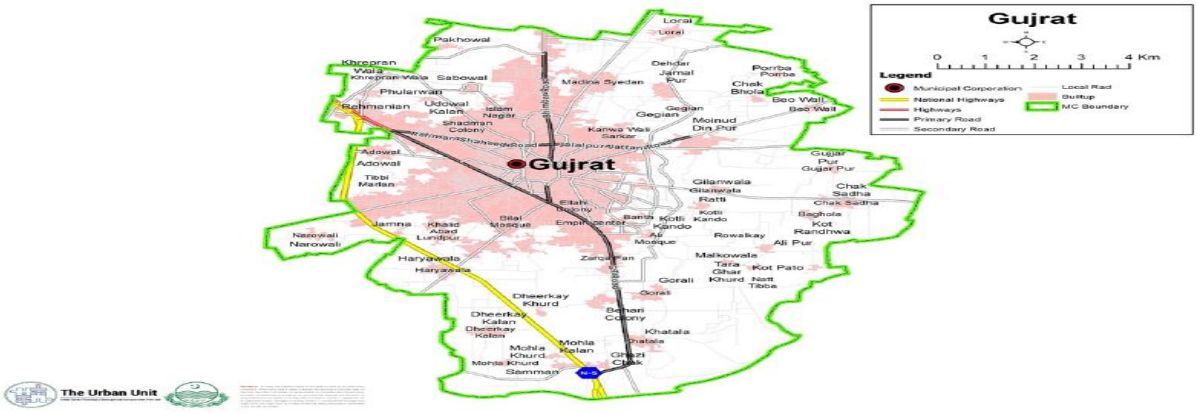
H1. Higher the level of participation in behavior change interventions, higher the level of Knowledge Attitude and Practice (KAP).

H2. Higher the level of participation in behavior change interventions, higher the level of improved water and sanitation, hygiene (WASH) practices

H3. Higher the level of participation in behavior change interventions, higher the level of child healthH4. Higher the level of participation in behavior change interventions, higher the level of sustainable community development

4. Methods and Material

The study is an explanatory research with quantitative techniques for investigating the relationship among variables of the study. The survey technique and method were adopted to collect primary data from target communities. A structured questionnaire was constructed with the questions regarding demographic or background characteristics and by incorporating integrated behavior change interventions, knowledge, attitude and practice (KAP), child health (CH) and sustainable community development (SCD) for congregation evidence related to under deliberation phenomenon.



Population of the current study was consisted of the mothers, living in the area (Urban & Rural) of district Gujrat. Unit of analysis was mothers who had one child below the age of five years and these mothers living in urban or rural areas of district Gujrat for one year. A list was obtained from Local Government and Community Development Department Gujrat (LG & CD, 2022) that contained a complete registration record of the last five years (January 2016 to December 2021). According to that list there were 1, 73, 169 mothers from the whole district Gujrat, who were considered for this study. A stratified multistage random sampling strategy was used for selection of sample. For this purpose, total 129 union councils (UCs) of district Gujrat are stratified into three strata according to their characteristics. Stratum one contains 26 rural union councils where the Government of the Punjab and its alliance international organization (UNICEF) carried out awareness and behavior change interventions. Stratum two contains 28 urban union councils of the district while stratum three contains the remaining 75 union councils of rural areas of the district. In stratum two and three, no behavior change interventions have been carried. A sample

of 13 union councils is proportionally allocated, to each stratum, three UCs from stratum one, three UCs from stratum two and seven UCs from stratum three were selected respectively. From the selected 13 union councils, a sample of one ward from each union council were selected and completely investigated. After considering all requisite assumptions regarding statistical tests, the researcher was in better condition to finalize the sample size for this study which can justify both compulsory requirements; sample size required as per statistical analysis and the representative sample size through sample calculation formula. This comprehensive comparison of statistical formula and statistical technique for determination of sample size, presented that it was a better option to use a sample of 500 or more to cover complete requirements for statistical analysis. After applying the formula of Taro Yamne (1967) and other necessary requirements it was a safe option to go for a sample of 520, which covered all the dimensions. The research instrument was developed by incorporating a standardized scale of knowledge, attitude and practice (KAP), behavior change interventions, child health (CH), water and sanitation, hygiene (WASH) and sustainable community development (SCD), therefore the validity of all considered items have already been tested. However, in this study researchers had adjusted these scales in the light of socio-demographic and background aspects were be added. Keeping in mind the changes in instrument validity was tested and checks the instrument reliability Cronbach's Alpha was applied.

5. Results and Analysis

Descriptive results of the study estimated the number and percentages of collected data and summarized the main characteristics. For the rational discussion and coherent explanation of the study findings, it is necessary to have deep understandings regarding the responded socio-demographic profile, as presented in table below. After conclusive process of data screening there were 502 respondents (mothers) considered appropriate sample for further analysis and study results and the table below presented out of total there are 254 (50.6%) respondent who fall in the age limit of 25-34 years, and 165 (32.9%) respondents were 35-44 years old at the time of this study. Based on collected data, maximum respondents were seen to possess educational qualifications of up to less or matriculation (high school) 190 (37.8%) and intermediate 120 (23.9%). Results indicated that there were 289 (57.6%) respondents who belonged to the joint family systems and a big portion as 169 (33.7%) belonged to the nuclear family system. The biggest portion among the respondents falls in the bracket of monthly income around Rs. 20001 to 40000 which were 192 (38.2%), the second highest response 113 (22.5%) fall in the group who have Rs. 40001-60000 monthly household income. When respondents asked about their children's health a large portion 304 (60.5) respond that their children have health issues which were mostly infectious or viral and 40 (8%) reported that their children faced accidental issues during the period of last 12 months.

Table 02: Respondent's qualification, family system, household income and health issues

Demographic characteristics	Description of characteristics	N	%
Respondents Qualification	1-5	56	11.2
	6-10	190	37.8
	11-12	120	23.9
	13-14	81	16.1
	15-16 or Above	55	11.0
	Total	**502**	**100**
Respondents Family System	Nuclear	169	33.7
	Joint	289	57.6
	Extended	24	4.8
	Single Parent	17	3.4
	Any other	3	0.6
	Total	**502**	**100**
Monthly household income in rupees	Below or 10000-20000	93	18.5
	20001-40000	192	38.2
	40001-60000	113	22.5
	60001-80000	60	12.0
	80001 or above	44	8.8
	Total	**502**	**100**
Health issues faced by children during last 12 months	don't face any health issue	19	3.8
	Infectious/Viral	304	60.5
	Accidental	40	8.0
	Inherited	11	2.2
	any other	130	25.9
	Total	**502**	**100.0**

The largest portion of respondents 326 (64.9%) get their water for drinking from borehole or hand pumps and 152 (30.3%) respondents get water from filtration plants or water supply systems. Results show that 262 (52.2%) don't purify drinking water at home before use while only 134 (26.7%) respondents boil water at home before use. Similarly, 408 (81.3%) have a specific hand washing facility in their homes and the largest portion of respondents 427 (85.1%) wash their hands only with water and feel water is enough for cleaning their hands at critical timings. There were 19 (3.8%) respondents who reported that they do not wash their hands with water and try to clean hands with cloth or tissues accordingly.

Table 03: Source of drinking water, treatment at home, hand washing facility and practice

Demographic characteristics	Description of characteristics	N	%
Main source of drinking water?	Borehole/Hand pump	326	64.9
	water supply/Filtration plant/Public tab	152	30.3
	River/Canal/Well	2	.4
	Purchased (Bottle/Tanker)	17	3.4
	Any other	5	1.0
	Total	**502**	**100.0**
Purification of drinking water at home	Don't Purify	262	52.2
	Boiling	134	26.7
	Use Filters	98	19.5
	Use Chlorine	5	1.0
	Any other	3	.6
	Total	**502**	**100.0**
Specific hands wash facility/place at home?	Yes	408	81.3
	No	94	18.7
	Total	**502**	**100.0**
Usually use to wash hands at critical time	water and soap	51	10.2
	only water	427	85.1
	Use cloth/tissue	19	3.8
	Not regular wash	4	.8
	any other	1	.2
	Total	**502**	**100.0**

When the respondents were asked about the participation in any awareness program or behavior change interventions regarding water and sanitation, hygiene; out of total 502 respondents only 160 (31.9%) respondents reported that they or any other member from their family have participated in these programs. The major portion of respondents 342 (68.1%) had not participated in any awareness intervention regarding WASH.

Table 04: Participation of respondents in behavior change interventions

Demographic characteristics	Description of characteristics	N	%
Participation in WASH program	Yes	160	31.9
	No	342	68.1
	Total	**502**	**100.0**

The relationship among participation in behavior change interventions and KAP is positively significant (0.000) and change in one variable can affect the results of other. When the respondents were asked regarding WASH, there are 68.1% respondents from intervened areas who fall in high level and 32.5% from non-intervened areas. These results also indicated significance (0.000) relation as higher the level in behavior change intervention, higher the level of water and sanitation, hygiene practice in daily life.

Table 05: Relationship among participation in behavior change interventions

		YES		**NO**		**Total**		**Asymp. Sig. (2-sided)**
		N	**%**	**N**	**%**	**N**	**%**	
Knowledge, Attitude and Practice	**High**	107	66.9	131	38.3	238	47.4	**0.000**
	Medium	48	30.0	137	40.1	185	36.9	
	Low	5	3.1	74	21.6	79	15.7	
	Total	**160**	**100**	**342**	**100**	**502**	**100**	
	Pearson x^2 (44.480), significant at $p<.05$							
Water, Sanitation and Hygiene	**High**	109	68.1	111	32.5	220	43.8	**0.000**
	Medium	45	28.1	97	28.4	142	28.3	
	Low	6	3.8	134	39.9	140	27.9	
	Total	**160**	**100**	**342**	**100**	**502**	**100**	
	Pearson x^2 (61.822), significant at $p<.05$							
Child Health	**High**	83	51.9	120	35.1	203	40.5	**0.003**
	Medium	51	31.8	159	46.5	210	41.8	
	Low	26	16.3	63	18.4	89	17.7	
	Total	**160**	**100**	**342**	**100**	**502**	**100**	
	Pearson x^2 (36.222), significant at $p<.05$							
Sustainable Community Development	**High**	78	48.8	81	23.7	159	31.7	**0.038**
	Medium	59	36.9	169	49.4	228	45.41	
	Low	23	14.4	92	26.9	115	22.9	
	Total	**160**	**100**	**342**	**100**	**502**	**100**	
	Pearson x^2 (91.114), significant at $p<.05$							

When the respondents from both categories were asked regarding the health of their under five children there is also difference as 51.9% respondents from intervened areas have high

category and only 35.1% from non-intervened areas. The respondents who participated in behavior change intervention are more proactive regarding water and sanitations practice and its relationship with the health of their children. Significance (0.003) relation predicted that higher the level of participation in behavior change intervention regarding WASH, higher the level of child health practices and conditions. The result from table above shows that there is a significance relationship among the respondents who had participated in behavior change interventions and among those who did not participate. The results from descriptive table highlighted that out of total 502 respondents there are 304 (60.55%) respondents who reported that their children faced health issues during last one year. Out of total affected respondents 304 there were 91 respondents who participated in behavior change intervention and 213 respondents were from non-participated respondents. The table below shows that the difference in children faced diseases from last 12 months from both groups as 39.6% respondents who faced WASH related issues as diarrhea, viral infections among many others, while there were 72.3% respondents reported that their children face WASH related health issue during the period of last 12 months. This indicated that there is a significance (0.000) relationship among participants in behavior change interventions and WASH related diseases and test statistics also prove with "F" values as 0.123 and "T" 22.369.

Table 06: Diseases among participated (Intervened) and non-participated (Non-intervened) respondents

	Participation		**Not participation**		**Total**		**F**	**T**	**Asymp. Sig. (2-sided)**
	N	**%**	**N**	**%**	**N**	**%**			
WASH (Diarrhea, Infection etc)	36	39.6	154	72.3	190	62.5	.123	22.369	0.000
Weather related	29	31.8	37	17.4	66	21.7			
Any other (Inherited, accidental etc)	26	28.6	22	10.3	48	15.8			
Total	**91**	**100**	**213**	**100**	**304**	**100**			

Pearson x^2, significant at $p<.05$

Results of the study proved differences among those who participated and did not participate in behavior change interventions. Researchers further attempted to explore that how these interventions can have decreased or increased the economic burden of medication. Out of total 160 respondents who participated in behavior change intervention 68.1% reported that they did not spend any money on WASH related disease while 28.7% reported that they spent about 0-50000 on medication. The respondents from non-intervened areas reported that there were 43.7% respondents who spent this money on their WASH related diseases during the period of last 12 months. The test statistics "F" and "T" also proved the significance (0.000) relationships among participation in behavior change interventions and expenditures on medication.

Table 07: Participation in behavior change interventions and expenditure on medications

	Participation		Not participation		Total		F	T	Asymp. Sig. (2-sided)
	N	**%**	**N**	**%**	**N**	**%**			
Nil	109	68.1	80	23.4	189	37.6	.392	36.997	0.000
Up to 50000	46	28.7	173	50.6	219	43.7			
50001-100000	3	1.9	61	17.8	64	12.7			
100000 and above	2	1.3	28	8.2	30	6.0			
Total	**160**	**100**	**342**	**100**	**502**	**100**			

Pearson x^2, significant at $p<.05$

In most of the cases the test of anova was used to check and compare the equality of three or more than three means, however when the anova test is used for the means from only two samples, it is considered a t-test and compare means of independent variables. This type of anova test is based on the comparison of variation among the data samples to variance within every particular sample of the study. If the between variance is larger than the within variance, the means of various sample will be considered not equal. Similarly, when the within and between variance are approximately the same then we can say that there is not any significance difference among the means of variables. With the addition of anova test assumption regarding population involved, it falls in the parametric test or into the category of hypothesis testing. In the case when the population distribution is not normal, an anova test could not be applied to estimate the equality variable means, instead researchers use a non-parametric test, which is considered more general from the testing of hypotheses and does not rely on distributional assumptions. In this study anova test is used to understand whether all variables considered in this study are equally important according to the living areas of the respondents or not. The hypothesis of anova test is "Ho" is considered that all the types of living areas have equal effect on considered variables and "Ha" is that there is a different effect on overall variables.

Table 08: Association with respect to living area of respondents

		Urban Area	Rural Area (intervened)	Rural Area (Non-intervened)		
Respondents living Areas		**Mean (standard deviation)**	**Mean (standard deviation)**	**Mean (standard deviation)**	**F**	**P**
	KAP	1.4 (0.42)	1.6 (0.52)	1.6 (0.49)	5.86	0.003
	WASH	1.5 (0.51)	1.6 (0.35)	2.9 (0.73)	312.82	0.000
	CH	1.6 (0.50)	1.8 (0.54)	1.7 (0.52)	5.63	0.004
	SCD	1.7 (0.40)	1.9 (0.47)	1.8 (0.48)	4.76	0.009

Above table presented the results and we can see that the significance value of all considered variables is 0.000 which is less than assumed "P" value so the "Ho" is rejected and the "Ha" is considered accepted. On the basis of the above statistical test we conclude that the observed averages of different areas are not the same and also don't have equal impacts on all considered variables.

Table 09: Association with respect to participation of behavior change interventions

		Yes	No	F	P
Attend		Mean (SD)	Mean (SD)		
behavior	**KAP**	1.6 (0.51)	1.5 (0.47)	7.34	0.007
change	**WASH**	1.7 (0.56)	2.4 (0.94)	71.15	0.000
intervention	**CH**	1.8 (0.54)	1.6 (0.50)	15.12	0.000
	SCD	1.9 (0.46)	1.8 (0.46)	7.27	0.009

Similarly, the above table presented the results according to the participation in behavior change interventions and its impacts on all considered variables in the study. On the basis of results, we can see that the significance value of all considered variables is 0.000 which is less than assumed "P" value so the "Ho" is rejected and the "Ha" is considered accepted. We conclude that the observed averages of respondents who participated are not the same as the respondents who did not participate and also don't have equal impacts on all considered variables.

5.1 Confirmatory Factor Analysis

Before the testing of a model and running an inferential statistical test as a structure equation model, confirmation of factors is compulsory. Through confirmatory factor analysis researcher confirms the most suitable indicator for considered variables and removes all indicators which have less or weak relationship. In the present study researcher has selected smart PLS 3.0 software for this purpose and tried all indicators of variables one by one. Only the most appropriate indicators which have strong impacts is consider for further analysis, as detail is provided in table below and the calculation of these indicators

5.2 Structure Equation Model (SEM) through smart PLS-3

Smart PLS is one of the most suitable tools for measuring the models, as the model of this study is also tested by using this software. The results of the fitted model are presented in the below graph indicating that knowledge, attitude and practice of mothers have significant positive impacts in water and sanitation, hygiene practice in daily life activities. Similarly, the measurement of all other variables and their impact level upon other is also presented in the given graph.

5.3 Intervened Communities Fitted Model

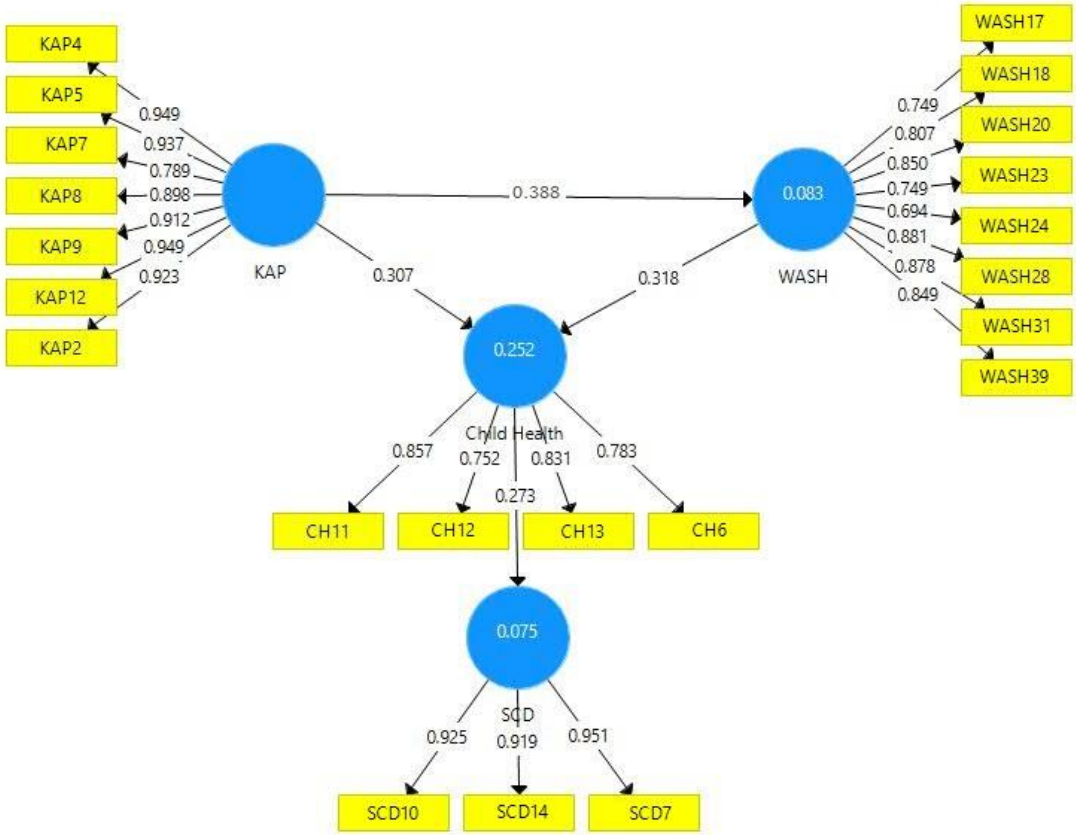


Figure 02: Intervened communities fitted model and path results (β-values)

5.3.1 Evaluation and Measurement of Intervened Communities Fitted Model

Smart PLS 3.0 calculated the values of all indicators and presented the most suitable (β-values more than 0.60) for the considered variable at the first step. It also ascertained the most appropriate loading of concern indicators which theoretically advised with respective variables. The considered model is calculated in order to confirm that the item measured the variables were expected to measure, and consequently ascertaining the considered instrument is reliable. Moreover, the prime objective of model testing is to diagnose and assess the relationships among observable and underlying variables. As such, it becomes most important to find the suitable indicators for ensuring the accurate operationalization of considered variables which include for further justification and validity.

The intervened communities fitted model presented the path results (β-values) loadings of all items taken in this study. Knowledge, attitude and practice (KAP) has a positive significant relationship (β=0.388) with water and sanitation, hygiene (WASH). Results from intervened communities also indicated that KAP also have positive relationship (β=0.307) with child health. Similarly WASH and Child health (β=0.318) and child health and sustainable community development have significant (β=0.273) relationships.

5.4 Non-Intervened Communities Fitted Model

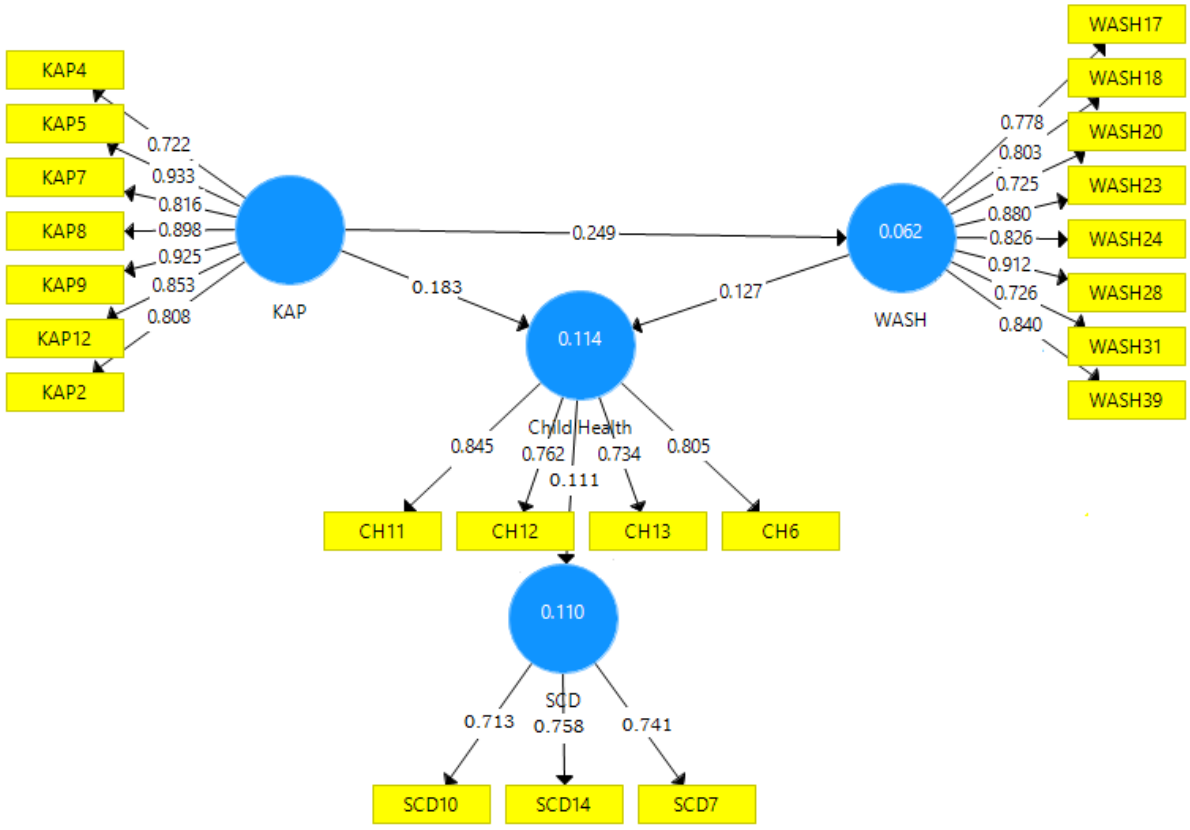


Figure 03: Non-intervened communities fitted model and path results (β-values)

The non-intervened communities fitted model presents different results as compared to intervene communities. It was hypotheses that higher level of participation in behavior change interventions has positive impacts on KAP, CH and SCD. The results of the study proved the hypothesis and the respondents from the non-intervened community have poor conditions and practices regarding WASH and CH. As knowledge, attitude and practice (KAP) have poor relationship (β=0.249) with water and sanitation, hygiene (WASH). Results from non-intervened communities also indicated that KAP also has weak impacts (β=0.183) with child health. Similarly WASH and Child health (β=0.127) and child health and sustainable community development have impacts (β=0.111).

5.5 Path Coefficients for Hypothesis Testing

For the purpose of hypothesis testing through smart PLS first was proceeds to generate the path coefficients which are presented in the table below. Bootstrapping technique with 5000 bootstrap sample was run, this is basically bigger than the actual sample size of the study for generating the t-values and meeting the suggested conditions by Wilson (2011), Hashim (2012), Hair et al. (2021) and Lowry et al. (2014). The prime objective to run the model with all considered variables of the study is to ascertain the findings of direct relationships among dependent and independent

variables, which emanate from the study objectives in this research. The results presented in table indicated that the first hypothesis (H1) has a positive significant relationship among knowledge, attitude and practice with water and sanitation, hygiene at 0.000 significance level with (β=0.250, t=4.746, p=<0.000). Similarly, the second hypothesis (H2) also has positive relationships and supports our assumptions as water and sanitation, hygiene and direct impacts on child health at 0.002 significance level with (β=0.158, t=3.066, p=<0.002). Thereafter the third hypothesis (H3) was found accepted and presented a positive relationship among considered variables as knowledge, attitude and practice have direct impacts on child health. This positive relationship is significant at 0.005 with (β=0.131, t=3.021, p=<0.005). Fourth hypothesis (H4) of the study also supported the findings as child health has a direct positive relationship with sustainable community development at significance 0.000 significance level with (β=0.210, t=4.328, p=<0.000).

Table 10: Model results, direct relationships among study hypothesis

Hypothesis No	Hypothesized Effect	Path coefficient	Standard Error	T-Value	P-Value	Decision
Hypothesis-1	KAP>WASH	0.250	0.053	4.746	0.000***	Supported
Hypothesis-2	WASH>CH	0.158	0.051	3.066	0.002***	Supported
Hypothesis-3	KAP>CH	0.210	0.048	4.308	0.000***	Supported
Hypothesis-4	CH>SCD	0.303	0.042	7.198	0.000***	Supported

***: P<0.01; ii. **: P<0.05; *: P<0.1

6. Discussion and Conclusion

6.1 Discussion

In the present study integrated behavior change interventions were taken as independent variables, whereas water and sanitation, hygiene practices, child health and sustainable community development were taken as dependent variables. The model of the study explains direct effects of knowledge, attitude and practice on water and sanitation, hygiene, child health and sustainable community development. It also explains the direct effect of water and sanitation, hygiene on child health and sustainable community development. Furthermore, it explains the indirect effect of knowledge, attitude and practice on child health and sustainable community development. To carry out the major distributional analysis descriptive and inferential analysis are applied. This quantitative study is supported with a theoretical framework which underpinned the integrated behavior model for water and sanitation, hygiene (IBM-WASH). Integrated behavior model for water and sanitation, hygiene based on the two behaviors change theories as theory of reasoned action (TRA) and on the theory of planned behavior (TPB) by Martin Fishbein and Icek Ajzen. This study has used a survey method to collect primary data from respondents (mothers), through applied a stratified multistage random sampling strategy. The universe of this study was the urban and rural communities of district Gujrat, Punjab, Pakistan. Results findings presented in the

form of numbers, percentages and frequency distributions while inferential analysis is estimated and presented in the form of association and anova findings. The significance values of factor loading, discriminant validity, convergent validity, content validity along with path diagram and goodness of fit were measured by using smart PLS 3.0 software. The findings of hypothesis testing also asserted from the diagram and statistics from the path coefficient values. The findings of this study explains that independent and dependent variables that are integrated behavior change interventions, knowledge, attitude and practice, water and sanitation, hygiene, child health and sustainable community development had relationships between them, though the intensity of correlation and association among variables do vary. The findings of the study suggest that there is a positive relationship among knowledge, attitude and practice and water and sanitation, hygiene practice in daily life. These findings are also in line with existing research study findings (Alula, 2018; Gizaw *et al*., 2019; Abuzerr *et al*., 2020; Almas *et al*., 2021). For instance, usually people claim that they are well aware regarding sanitation and hygienic practice, but the research data (Mary, 2018; Webb *et al*., 2019; Moreno, 2020) shows the report of poor practices. Further, in Pakistani society normally mothers are responsible for sanitary, hygienic and food management for the family, and poor knowledge and unsafe practice can have long lasting synergic effects on family members, especially on children under five years.

6.2 Conclusion

The study very clearly indicates the role of integrated behavior change interventions for sustainable community development. Those individuals who have participated in integrated behavior change interventions regarding WASH are more successful in improving their basic knowledge, health and wellbeing. Enhancement of an individual's knowledge and behavior change helps them to get things done accordingly and positively impacts on individuals, family and community life. Improved WASH conditions and practices by individuals improve not only their sanitary and hygienic environment but also play an important role for their social, economic and health conditions. This is a significant finding of the study that integrated behavior change interventions help in understanding existing practices and enhance it according to the available resources. Another important objective of this study is to examine the WASH practices and its impacts in intervened and non–intervened communities. It is found that water and sanitation hygiene have a significant relationship with child health and sustainable community development. Communities where integrated behavior change interventions have been carried out have significant differences in all aspects of WASH. Water and sanitation hygiene is also a significant moderator for enhancing child health conditions and improving sustainable community development. In the context of Pakistani society mothers normally play dual responsibilities at household level; at one hand they are responsible for their household activities and at the same time caring for children. In this scenario, mother's role is more sensitive and a minor mishandling can cause serious health, life

and economic burden in the family. Results of the study strengthen this assumption on the basis of intervened and non-intervened community's data, that integrated behavior change interventions have significant impacts on mother's behavior in daily life practices. Another important objective of the study is to understand the impacts of knowledge, attitude and practice of WASH on child health and sustainable community development. The findings of the study confirm positive association among KAP and WASH practices. As described earlier, the KAP of individuals is a personal trait which helps to maximize not only their capabilities and capacities but also have direct and indirect impacts on CH and SCD. Socio-economic and background aspects such as living area, family system, qualification, household income among others help individuals to understand their actual situation. This understanding helps them to change their behavior and long held habits to perform better and attain improved social, economic situation of families and communities. Overall, the findings of this study are useful to have understanding regarding the role of integrated behavior change interventions for sustainable community development. It helps to identify potential aspects which not only enhance existing behavior of individuals but also provide a way forward of transformation of communities and sustains their development. It also helps to understand the role of various background and demographic factors like family system, living area, age, income and qualification among others in enhancing knowledge, attitude and practice.

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