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Research Article

Intervention Mapping: A Multi-Stage Investigation to Control Dermatological Infections at Primary Level

Shahzad Mahmood[1]*, Nauman Ali Chaudary[2], Muhammad Sameer Anwar[3], Muhammad Naveed Tahir[2], Jafar Riaz Kataria[2] and Komal Syed[4]

[1]*Department Public Health, Allama Iqbal Medical College Lahore, Pakistan*

[2]*Department of Public Health, University of the Punjab Lahore, Pakistan*

[3]*University of Health Sciences Lahore, Pakistan*

[4]*D-Pharmacy, Hamdard University Karachi, Pakistan*

***Corresponding author:** Dr. Shahzad Mahmood, MBBS (Allama Iqbal Medical College Lahore, Pakistan), M. Phil Public Health (University of the Punjab Lahore, Pakistan).

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Abstract

The countryside, home to many primary health care centers, faces a high burden of skin infections due to close contact with infectious agents and poor adherence to preventive measures. This negligence exacerbates the spread of bacterial, viral, parasitic, and fungal skin diseases. Common symptoms include itching, rashes, bumps, sores, discoloration, dryness, eczema, and peeling, varying in severity. These conditions highlight the need for translational research to reduce disease load at the primary care level. This study aims to identify factors contributing to the spread of skin infections in rural areas and implement public health interventions. Using the Intervention Mapping (IM) framework, an evidence-based program is developed and applied at the community level. The study adopts a mixed-methods approach, divided into three phases: pre-intervention, intervention, and post-intervention. The pre-intervention phase involves epidemiological analysis and qualitative assessment to identify contributing factors and develop a plan. The intervention phase focuses on community-based actions such as health education, stakeholder engagement, and prevention strategies. The evaluation phase shows a significant reduction in skin infections, providing a foundation for future preventive research.

Keywords: Intervention mapping, Evidence-based intervention, A Control on Dermatological Infections, Multi-Phase Study, Primary Prevention and Health Promotion, Community strengthening

Introduction

Dermatological infections form the major chunk of disease at poor household [1] level contributing in the shuddering of humanity. In such localities, the skin infectious diseases that are most prevalent include Scabies, Warts, Molluscum Contagiosum, Tinea pedis, Tinea Corporis, Ringworm, Candidiasis, Cellulitis and Folliculitis. Besides poverty, the lack of knowledge and unsatisfactory sanitary and hygienic conditions work as the contributory factors in propagation aggravation of the diseases. This research entails a complete study of the risk factor, transmission factors and control on skin infections among different age and gender groups.

Background of the Study

The field of public health has used intervention mapping as a tool to design a health promotion and primary prevention program and thereby to control the spread of diseases. A large number of articles are in vogue concerning this branch of evidence-based pub-

lic health. It has a theoretical concept whose practical application demands the amalgamation of community assessment, community needs, development of need-based program design, implementation of health program, and evaluation of the results thus obtained [2]. The community participation is a key in planning and implementation of a community-based program. Over the past two decades, the process of Intervention Mapping (IM) has undergone substantial advancements, supported by a robust theoretical foundation that has shaped public health practices. This foundation serves as a practical guide for implementing steps to control infectious diseases. However, every study encounters numerous limitations. For example, research aimed at developing preventive measures against pandemics often relies on the health belief model, focusing primarily on individual-level interventions. This approach tends to overlook interpersonal and community-level analyses, which are essential components for effective disease prevention within communities [3]. This neglect in philosophical roots resulted in the lack of prevention at primary level and an increase in the number of skin infections like scabies and tinea infection [4]. The intensity of the issue necessitates the assumption that there should be a study with strong philosophical foundations and can draw a clear map of interventions necessary to cope with the dissemination of infectious diseases. The need for research thus arises keeping in view the high prevalence of skin infection [5].

Statement of Problem

Health sector in the countryside of Pakistan is faced with twin problems. At first, the extreme lack of capital investment on the rural health program in Pakistan [6]. On the other hand, the health sector is being run on the curative model of healthcare [7], with least focus on the preventive model. This dual dilemma gives rise to a substantial increase in the spread of skin infections. Contrarily, a health sector shall include community whims and requirements and be acceptable by the community and thus it should be based on Health Belief Model (HBM), Social Cognitive Theory (SCT) and Ecological Theory (ET). If the theoretical foundations of health sectors are strengthened with accumulation of these models, the high occurrence of skin infection can be reduced.

Objectives of the Study

The core objective of the study is to design a multiphase research methodology, IM, and then evaluate its effectiveness after its implementation at primary health level. However, the operational objectives include:

1) To analyze the prevalence of dermatological infectious diseases in a rural area and segregate their prevalence on the basis of age and sex.
2) To assess multiple factors involved in propagation of skin infectious diseases at primary healthcare level
3) To craft and evidence-based intervention framework focussing on the control of the spread of skin infections
4) To engage community and stakeholders for behavioral, systematic and environmental change that is vital to reduce the burden of disease
5) To analyze the impact of intervention in terms of the change in prevalence of skin infectious diseases
6) To propose a potential and workable mechanism for disease prevention in the form of policy recommendations

Research Hypothesis

The study is based on a directional hypothesis that is,

"By Intervention Mapping, healthcare workers can reduce the prevalence of dermatological infectious diseases by 15% after two weeks of effective implementation of a community health program".

Significance of the Study

The pivotal role of research is evident through the solid theoretical foundations that serve as the cornerstone for innovation and future exploration. Intervention Mapping (IM) enhances the conceptual framework for infection control, especially in resource-limited settings where affordable and efficient strategies are critically required. It offers a multidisciplinary approach to advancing health promotion efforts. In addition to offering a conceptual framework, the study holds notable practical value and numerous benefits through its application. It enables rural communities to curb the spread of microbes, thereby enhancing quality of life and reducing both morbidity and mortality. Furthermore, it guides healthcare workers to adopt a proactive approach to dermatological infection prevention rather than reacting solely to disease treatment. This strategic transition is particularly crucial in regions facing economic challenges, as reducing disease incidence can significantly lower healthcare expenditures on curative services. As such, the study serves as a beacon of hope for struggling healthcare systems, providing actionable policy recommendations for policymakers and strategic planners.

Literature Review

Intervention Mapping

The branch of evidence-based public involves the preparation, implementation and evaluation of a community-based health prevention and promotion program [8]. It consists of three phases, encompassing six steps. The pre-intervention phase includes three steps as: need assessment and analyzing the epidemiological distribution of skin infections, drawing program objectives, and formation of community acceptable health program design. The intervention phase deals with a comprehensive implementation of a population health program. The post-intervention phase contains evaluation plans and review strategy [9].

Dermatologic Infections and their Control

Skin infections are common in rural sectors. These range from scabies and boils to pyoderma, dermatitis, tinea and folliculitis. The habit of nail trimming and cleanliness is nearly extinct in the chil-

dren residing in areas under a basic health unit. Meanwhile, they are used to having a bath in the same ponds in which animals take a bath. The pathetic scenery is a safe haven for dermatologic infections. Scabies and fungal infections are most prevalent. According to an estimation, 300 million cases are being reported in a year [10]. Scabies is a typical outcome of poor personal hygiene. The germ is transmitted through eggs residing in fingernails. When children become negligent in nail hygiene, they become a natural habitat for the germs and their egg. While scratching on the body, these eggs are implanted on that body part where they cause disease. The course of disease can be simple as itching and can also get complicated with rashes and swelling all over the body. When an infected or carrier meets a healthy person, it can gift him the disease. This partially explains the highest prevalence of scabies among the other dermatological infections at the primary healthcare level [11].

The trend is followed by the fungal infections like Tinea Capitis, Tinea faciei, Tinea Pedis and Tinea Corporis [12]. Children are more affected than the adults [13]. because in least educated geographical zones of Pakistan Children are being neglected. They are used to play on dirty grounds and sometimes on contaminated sites. Apart from this, in the areas where this research is being carried out, children are seen to have a bath in the ponds where animals drink water and take a bath. Furthermore, barbers play an important role in the spread of infection in this area. The profession of barbers is not fully developed in remote areas. They generally cut hair and trim nails of the whole village with a single blade. The irony is that besides executing these duties, they also perform circumcision with that blade. Consequently, if an individual is infected by a disease like viral warts, it becomes pertinent that the whole village will now or then catch the infection. Therefore, skin infections are common in the countryside [14].

Study Design and Methodology

Research Design

This study employs a complex intervention design based on the intervention mapping model, addressing various ecological levels such as the individual, family, group, and community. Each level is carefully assessed to identify its unique needs and the corresponding interventions required [15]. The study is divided into three phases, encompassing six components in total. The first phase, known as exploratory analysis, focuses on three sub-levels of intervention mapping. The initial sub-level, contextual evaluation and demand analysis, involves assessing the burden of dermatological infectious diseases and determining the necessary interventions. The second sub-level establishes program objectives, while the third focuses on the development and design of program components. The second phase, referred to as the Program Intervention Phase, is critical and comprises a single component: the Program Adoption and Implementation Plan. Following the successful execution of this phase, the final phase, titled Evaluation and Impact Analysis, is conducted. This phase includes two sub-levels: the formulation of an evaluation plan and the development of a review strategy [16].

Study Focus and Sample Population

The study is conducted at a Basic Health Unit in Punjab, Pakistan. It is the primary pillar of primary healthcare in the state. It is a primordial presentation site of patients from nearly 10 villages and covering 33432 people in a geographical zone of less developed area. The sample conduction site was a general OPD of 24/7 BHU and the intervention site was its field, covering 10 villages in its vicinity. Patients were segregated on the basis of their age and gender and they were asked questions about how they think they were infected and how they think they could have prevented this skin infection. This was the qualitative component of the study while the quantitative component deals with primary epidemiology of dermatological infectious diseases and reduction of their prevalence.

Timeline of the Research

The research was carried out in three and half months. The data collection for phase one was initiated on 15th of September 2024 and carried for 45 days till 30 October, 2024. The Intervention phase had a span of 15 days and then the final phase continued from 15th November, 2024 to 30 December, 2024 as described in Table 1.

Table 1: Timeline of the Project.

Phases	Phase Name	Date	Timeline
Phase 1	Exploratory Analysis	15 Sep, 2024 to 30-10-2024	45 days
Phase 2	Program Intervention	1 Nov, 2024 to 15-11-2024	15 days
Phase 3	Evaluation & Impact Analysis	16 Nov, 2024 to 30-12-2024	45 days
Final Report		10-Jan-24	10 days

Note*: Total Duration: 3 Months and 25 days.

Exploratory Analysis (Phase 1)

The onset of the first phase marked the start of a new arena in the healthcare sector of the research area. It was commenced on 15th of September 2024 with an aim at analyzing the epidemiology of Dermatological Infectious diseases and to carve a way to reduce their prevalence. It further consisted of some components covering the two kinds of research paradigms such as both quantitative reviews and qualitative analysis. These are

Contextual Evaluation and Demand Analysis

This deals with analyzing the epidemiology of skin infectious diseases in different villages under the surveillance of the basic health unit. The quantitative sub-component of phase 1 focuses on collecting data about the prevalence of dermatological infectious diseases and their segregation according to age and gender. Data is collected from the general out-patient department of the BHU and the number of patients presented with a skin disease is recorded along with the name of their village or vicinity. This provided the researchers with an opportunity to draw the estimated distribution of particular diseases, their endemicity and infectivity. The dermatological Infections reported from 15 Sep, 2024 to 30 Oct were 527 and can be tabulated according to age and gender distribution as shown in Table 2.

Table 2: Age & Gender Distribution of Skin Infections.

	Males					Females					
	6 months to 1 year	1 to 4 years	5 to 14 years	15-49 years	50 Years	6 months to 1 year	1 to 4 years	5 to 14 years	15-49 years	50 years above	Total
Total Cases	2	62	109	90	26	9	46	80	72	31	527

Production of Program Components & Design

This is the qualitative component of intervention mapping. Since an intervention is to be applied on the people, the rationale is to get reviews from people in order to devise a perfect public health intervention that can be effective. The data collection in this sub-component of phase 1 entails structured interviews, community analysis, field surveys, stakeholder's views and ethical consideration. The main source of getting leads was the out-patient department of the BHU. The patients presented here were asked certain questions as,

1. What do you think has caused the skin disease?
2. How do you think you could have evaded the skin disease?
3. What preventive measures do you think should be taken in your village so that skin diseases can be prevented?

Besides having a response from patients presented, community surveys and stakeholders views were also given due weightage. Stakeholders were healthcare workers, imam masjid, head of a village called Lumberdar, community elders and sarpanch. After a collaboration of all the key gate keepers, an intervention is designed that is applied in the intervention phase of the research.

Program Intervention (Phase 2)

This phase holds the same significance to the research as the heart does to the body. Its conceptual foundation is rooted in the program adoption and implementation sub-component of Intervention Mapping. A meticulously designed intervention, developed based on quantitative need assessments and qualitative surveys, was implemented within the population to curb the spread of infection through a public health-focused solution. This phase was conducted over a 15-day period, from 1 Nov, 2024, to November 15, 2024. The primary interventions developed included:

Intervention to Contain Dermatologic Infections

Skin infections are the second most common type of infections in rural settings. The data analysis suggests that the group of people most affected lie between 5 years to 14 years of age and from 15 years to 49 years of age. The number of patients reported in the former group were 189, while in later were 162 respectively. Moreover, male patients were reported more than the female patients. The intervention was mapped after conducting the demand assessment of the area in the qualitative subcomponent of research. Apart from community approach, targeted group approach was also taken in due consideration. After careful analysis of topology, the intervention applied was,

Society Level Intervention Scheme

Analogous to the campaign for respiratory tract infection control, a public health project was launched to contain skin infections including fungal infections, i.e., tinea corporis, pedis, cutis, boils, scabies and many more. The societal transformation to deal with skin infections required a comprehensive approach involving a collaboration of both healthcare workers and community gatekeepers, because behavioral shift is not easy to achieve. To meet the goal, seven Dermatology Task Forces (DTF) were formed. Each consisted of a medical officer, school health and nutrition officer, headmaster, head mistress, lambardar, imam masjid, lady health workers of the village, lady health supervisor, and barbers. Each DTF was assigned a task for health education in its village. The activities performed were: nail trimming exercises, hand washing, cleanliness, partial distancing. After successful demonstration of these activities, people were encouraged to adopt them through seminars and door to door campaigns. People were educated about the importance of taking a bath daily, keeping their nails trimmed, and partial distancing. Moreover, they were advised to take care of personal hygiene. In the villages, most of the cases of fungus and boils were related to the play fields and bathing ponds. Children were used to taking a bath in ponds of animals and most of the time their playing fields were also contaminated with animal dunks. Therefore, people were taught to stop their children from playing in dirty fields and taking a bath in contaminated water.

Group Focussed Intervention

Since most of the cases were reported in children and young people, targeted steps were taken along with the general measures. School health and nutrition supervisor was made in charge of DTF at school level and activities were conducted to contain scabies and fungal infections. All the schools and madrassas of the union council were visited; children were screened for the skin diseases: and partial distancing was applied. Moreover, the children in contact with the infected ones were selectively screened for the disease. Health education was provided along with the strict measures for nail trimming and personal hygiene. The inclusion of barbers in DTFs was given great importance because in rural settings the source of infection is seen to be the barber's blade. They were taught to change the blade before every haircut. A demonstration was played entailing how a barber's blade can infect the whole village and vicinity and how it can be more dangerous than an atomic bomb.

Evaluation & Impact Analysis Phase (Phase 3)

The final phase of the study consists of analysis of intervention impact, Impact evaluation, process evaluation and process feasibility. It encompasses the fifth and last sub-components of intervention mapping named evaluation plan and review strategy respectively. The basis of this phase is to evaluate the effectiveness of the intervention applied in phase 2. In context to this research, the basis of phase 3 is to analyze whether the said public health intervention was effective in controlling the burden of infectious diseases in the rural area or not.

Intervention Impact Analysis

Table 3: Age & Gender Distribution of the No. of Cases Reported in Post-Intervention Phase.

	Males					Females					
	6 months to 1 year	1 to 4 years	5 to 14 years	15-49 years	50 Years	6 months to 1 year	1 to 4 years	5 to 14 years	15-49 years	50 years above	Total
Total Cases	8	57	77	73	19	20	37	55	66	31	443

In order to determine the change in disease load after the intervention, the last phase started with the data collection about the number of patients reported with different diseases. The phase started from 15th November and lasted till 30th December 2024. The number of the patients reported with skin infections in these 45 days were 443 and tabulated as (Table 3).

An Evaluation of Pre & Post Intervention Dermatologic Infections

After an evidence-based intervention a significant number of decreases in infection spread occurred, as shown,

Decrease in the No. of Skin Infection Cases = No. of the Cases Reported in Phase 1- No. of the Cases Reported in Phase 3

=527 - 443

= 84

Percentage decrease in the No. of the Cases= (Actual Decrease/ Total No. in Phase 1)100

=100(84/527)

= 15.93%

So, a 15.93% reduction in the cases of skin infections has been witnessed as shown in Figure 1.

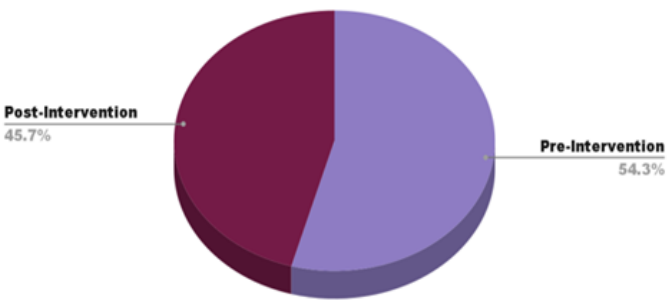

Figure 1:

Age Based Reduction of Disease Load After Intervention

Targeted intervention was also applied to the focus groups by segregating the general population in different groups based on their age. The age-based analysis is depicted in Figure No. 2 showing a decrease in the prevalence of skin diseases from 108 cases to 94 cases in the age bracket of 1 to 4 years, from 189 cases to 132 cases in the age bracket of 5 to 14 years, and 162 to 139 cases in the age bracket of 15 to 49 years. Among all age groups, there was a significant decrease in the number of dermatologic infections. However, an oxymoronic trend was seen in the age group between 6 months to 1 year where an unusual increase was noticed entailing an artifact in the research that shall be explained in the discussion portion of the study (Figure 2).

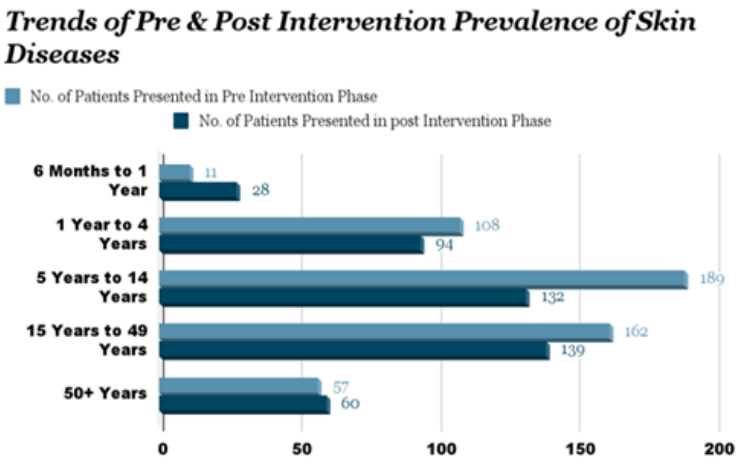

Figure 2:

Gender Based Trends of Skin Diseases

The biostatistics of gender-based trends are following:

No. of Male Patients Reported with Skin Infections in Pre Intervention phase= c1= 289

No. of Male Patients Reported with Skin Infections in Post Intervention phase= d1= 234

Decrease in No. of Male Patients Reported with Skin Infections= y1= 289- 234= 55

Percentage Decrease=Y1 =(y1/c1)100= (55/289)100= 19.03%

No. of Female Patients Reported with Skin Infections in Pre Intervention phase=c2= 238

No. of Female Patients Reported with Skin Infections in Post Intervention phase=d2= 223

Decrease in No. of Female Patients Reported with Skin Infections=y2=238-223= 15

Percentage Decrease=Y2=(y2/c2)100= (15/238)100= 6.3%

The gender-based analysis shows a reduction in the number of cases for male gender from 289 to 234, while for females it was from 238 to 223. Only 6.3% reduction in the disease load for the female gender was noted as compared to the male in which 19.03% reduction in disease load occurred. The analysis is shown in Figure 3.

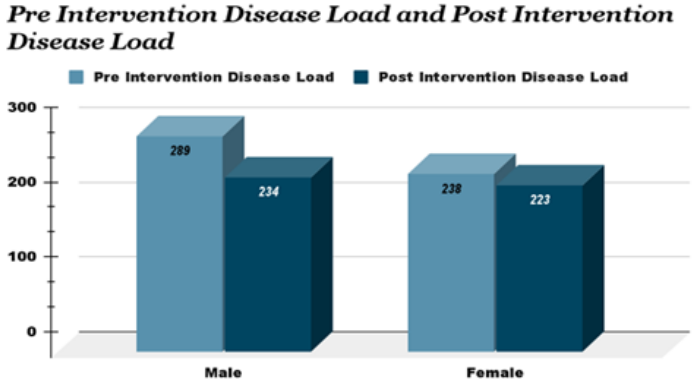

Figure 3:

Conclusion

The effectiveness of the study as assessed in the final phase, referred to as the evaluation and review strategy. Over a 45-day period, data on the patient load for the dermatological infectious diseases under study was collected from the OPD of the selected BHU. This data was organized, analyzed, and compared with the baseline data gathered in Phase 1. A two-week community-based initiative focused on health promotion and disease prevention led to a 15% reduction in the disease burden. In essence, prioritizing health promotion and disease prevention at the primary healthcare level can significantly lower disease prevalence, ultimately reducing healthcare costs and resource utilization. The prevalence of skin infections is reduced more in males than females. In males there is a 19.03% decrease in the number of the cases reported while this number in females is only 6.3%. The falling trends can be explained by the occupational hazards females face with the onset of winters. They work in fields as cotton pickers and skin diseases can easily spread in those occupational congregations where people are closer to one another, and to the infections. Mothers who caught scabies also became a source of infection for their young ones, explaining the rising trend of skin diseases in the age bracket of 5 months to 1 year [17]. Summing up, the result portrays a general decrease in skin infectious diseases as almost 15% a smaller number of patients are reported in the post intervention phase of the project. The mean trend remains the same in different age groups with some fluctuations. Moreover, the study also focuses on gender-based biostatistics and a reduction in the burden of dermatological infectious diseases in both the genders is noticed. Furthermore, ethical consideration is given a prime weightage in conducting the research. This range of canvas paired with a unique research design elaborates the significance of the study.

Acknowledgements

None.

Conflict of Interest

None.

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