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Article

The Effect of Training of Lady Health Workers to Enhance Family Planning Services: A Longitudinal Analysis for Punjab, Pakistan

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Abstract: Background: Delivery of quality family planning services depends on availability of skilled health care providers, which is often a challenge in Low- and middle-income countries. This study evaluates the effects of a targeted training program on family planning services delivered by the Lady Health Workers (LHWs) in six districts of Punjab, Pakistan. The primary goal was to enhance the quality and accessibility of family planning services, recognizing the pivotal role of LHWs in community health. **Methods**: Using a robust panel data difference-in-differences (DiD) approach, we analyzed the electronic medical records (EMR) of 1,410 LHWs over a nine-month period. This timeframe included both pre-training (July to December 2022) and post-training (April to June 2023) phases. Our assessment focused on the impact of training on five outcome variables: the number of follow-up clients, the number of Intrauterine Contraceptive Device (IUCD) clients, the number of condom clients, the number of modern method clients, and the number of injection clients. We also considered control variables such as LHW age, LHW education, the number of eligible couples in each LHW's catchment area, and a categorical variable for the districts. **Results:** The positive and statistically significant ($p<0.05$) coefficients across various service categories – Follow Up Clients [Coeff: 1.00, CI: (0.30 - 1.70)], IUCD Clients [Coeff: 0.23, CI: (-0.01 - 0.46)], Condom Clients [Coeff: 1.41, CI: (0.97 – 1.86)], Modern Method Clients [Coeff: 1.82, CI: (0.96 – 2.68)], and Injection Clients [Coeff: 0.32, CI: (0.14 – 0.50)]. These findings indicate enhanced productivity among LHWs who have received training, with results significant at the 95% confidence interval (CI). **Conclusion**: The study highlights the effectiveness of targeted training programs in boosting family planning services at the community level and offers insightful implications for policymakers and health practitioners. While focused on six districts in Punjab, these promising results emphasize the need for ongoing training and support for frontline health workers to bolster family planning initiatives.

Keywords: family planning; training program; lady health workers; public health and policy implication

1. Introduction

Pakistan, ranked as the world's fifth most populous country, currently faces a population growth rate of 2.55%, projecting an increase from the current 241 million to 470 million by 2050[1]. This demographic surge is poised to have profound implications for Pakistan's socioeconomic landscape and environmental conditions, thereby affecting its pursuit of achieving Sustainable Development Goals (SDGs), particularly SDG 3, which focuses on ensuring good health and well-being[2].

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In response to this rapid population growth, Pakistan made a commitment at the London Summit on Family Planning in 2012 to elevate its contraceptive prevalence rate (CPR) to 55% by the year 2020[3]. This commitment has been formally incorporated into national policies through the recommendations of the Council of Common Interests (CCI) and subsequently revised to target 50% by 2025[4,5]. However, the implementation of these commitments remains weak and resultantly, Pakistan's CPR has remained stagnant within the 30–35% range since 2007[6].

Family planning services in Pakistan are disseminated through a diverse array of service delivery channels. Traditional healthcare settings, encompassing both public and private facilities, serve as foundational hubs, offering a spectrum of family planning options. Complementing these, social marketing initiatives operate through various retail outlets, including pharmacies, markets, and shops, providing individuals with accessible commercial avenues for contraceptive methods and information[7]. A distinctive feature of Pakistan's family planning strategy is the public sector outreach program facilitated by Lady Health Workers (LHWs). These dedicated community health workers engage in door-to-door visits, increasing awareness and providing education and counseling on family planning[8].

Lady Health Workers (LHWs) program was initiated in 1994, this program emerged as a beacon of hope in raising public awareness about the accessibility and advantages of family planning services. With over 100,000 women currently serving as LHWs across all districts in Pakistan, the program has been instrumental in bridging the gap between healthcare providers and communities[9]. Each LHW, entrusted with the responsibility of serving a target population through monthly home visits, faces the formidable task of reaching approximately 1,000 people or 150 households, conducting five to seven visits daily[10].

However, as the LHW program evolved, expanding its role to encompass 22 core tasks, including responsibilities related to polio, tuberculosis, HIV, and other health areas, the initial focus on family planning began to face challenges[11]. The incremental benefits derived from the LHW program's primary mission were at risk of reduction, necessitating strategic interventions to revitalize its impact.

The DAFPAK project, funded by the Foreign, Commonwealth, and Development Office (FCDO), was launched in 2017[12]. This initiative aimed to enhance the quality and accessibility of family planning services for the general population, with a particular focus on training LHWs on providing modern family planning methods. Under the umbrella of the DAFPAK project, the Palladium Group took on the role of spearheading public sector service delivery (PSSD) in Punjab and undertook the crucial task of providing comprehensive family planning training to LHWs in six districts of Punjab.

There is limited research exploring the role of training community health workers to enhance family planning services in low- and middle-income countries. This paper focuses on evaluating the effectiveness of a training program for LHWs, particularly in terms of enhancing their knowledge and skills. Our primary aim is to assess whether this elevation in expertise leads to an increased number of FP services provided by these workers. By conducting a comprehensive analysis of this initiative, our study endeavors to shed light on the potential effect of such training on family planning outcomes across six districts in Punjab, Pakistan.

2. LHW Training Module

Under the DAFPAK-PSSD program, we selected seven cohort health facilities in each of the six program districts, encompassing Basic Health Units (BHUs), Rural Health Centers (RHCs), Tehsil Headquarter (THQ), and District Headquarter (DHQ). The selection of these facilities was made randomly from six districts in Punjab, following consultations with the Primary & Secondary Health Department (P&SHD). The chosen districts include Kasur, Gujranwala, Sheikhupura, Layyah, Khanewal, and Muzaffargarh. This decision was influenced by the time and budget constraints of the project. The training initiative commenced in January 2023 and concluded at the end of March 2023, spanning a comprehensive three-month period. Lady Health Supervisors (LHSs), who had

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undergone training as master trainers through the Training of Trainers (ToT) program, conducted the training sessions. The training curriculum was structured over two days.

Day 1 of the training commenced with a warm welcome, registrations, and participant introductions, fostering a collaborative learning environment. Prior to the first session, a pre-test was administered to gauge the baseline knowledge of the LHWs. Initial sessions centered around the family planning landscape in Pakistan, encompassing maternal and child health, population dynamics, and an overarching view of family planning. Engaging group activities, including chart presentations, encouraged active participation and sparked insightful discussions on the advantages of family planning.

Following this, subsequent sessions delved into diverse family planning methods, client-centered counseling, and the integration of a human rights-based approach. The latter part of Day 1 featured discussions on post-pregnancy family planning, the utilization of the MEC wheel, and an in-depth exploration of DMPA injection techniques. The day culminated in a session on provider-initiated family planning.

Day 2 began with a recap of the previous day's sessions, reinforcing participants' understanding. The curriculum for the day covered mapping strategies for family planning clients, referral methodologies, and the nuanced aspects of reproductive health in emergency situations. Participants engaged in scenario-based group activities, addressing psychological issues and counseling in the context of trauma and gender-based violence. The training further encompassed topics such as antenatal care, high-risk pregnancies, and the vital role of safe delivery kits in flood-affected areas.

The concluding session focused on family planning data, emphasizing data quality, analysis, and its practical application. A post-test was administered to assess knowledge retention, and the training concluded with an evaluation feedback session, providing participants with an opportunity to share their perspectives on the training's effectiveness and relevance. The structured and participatory nature of the training program facilitated a holistic understanding of family planning concepts and their practical implementation in diverse contexts for LHWs in Pakistan.

3. Materials and Methods

3.1. Data and Variables

In this study, Electronic Medical Records (EMR) sourced from the P&SHD were analyzed, specifically those gathered through the Integrated Reproductive, Maternal, Newborn, and Child Health & Nutrition (IRMNCH&N) Programme. At its core, IRMNCH&N Programme focuses on improving access to and the quality of reproductive health services, prenatal and postnatal care, newborn and child healthcare, and nutrition across Punjab, Pakistan.

The data collection was conducted at the grassroots level by Lady Health Workers (LHWs), with their records subsequently compiled by Lady Health Supervisors (LHSs). These compiled records were then transmitted to district coordinators, facilitating their integration into the EMR system.

The timeframe for data analysis encompassed a nine-month period, from July 2022 to December 2022, which was designated as the pre-training phase. Following this, a specialized training program was implemented from January 2023 to March 2023. The effect of this training was evaluated in the subsequent post-training period, which extended from April 2023 to June 2023. Significantly, this training intervention was distributed across only seven cohort facilities in each district, systematically targeting every LHW associated with these facilities. This methodological approach was designed to rigorously assess the effect of the training program on the targeted health workers.

Given the disproportionate number of LHWs in the control group as only seven facilities were provided training in each district, it was imperative to employ a robust statistical method to select a representative control sample. We conducted a power calculation, predicated on mean comparison of continuous outcome variables, determining that a sample size of approximately 1,200 would be requisite to achieve an 80% power. To align the control group with these parameters, we employed propensity score matching, utilizing the “psmatch2” command in STATA 17 software. This method facilitated the allocation of control LHWs through nearest neighbor matching. The final composition

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of our sample constituted 53% (749 LHWs) in the treatment group and 47% (661 LHWs) in the control arm, providing a balanced framework for comparative analysis. We used panel data of 1,410 LHWs spanning over a period of nine months for this research study. Throughout the study period, the attrition rate was zero, as there were no dropouts among the LHWs in both the treatment and control groups.

3.2. Model Specification

We employed the panel data difference-in-differences (DiD) methodology using STATA 17 software to examine the effect of training provided to Lady Health Workers (LHWs) to increase FP service delivery. In this analysis, our treatment group comprised 749 LHWs affiliated with the seven cohort facilities which were provided trainings, while the control group consisted of 661 LHWs from the same project districts but different facilities which had not received training. The specification for the difference-in-differences regression model is outlined below:

$$Y_{it} = \beta_0 + \beta_1 Treatment_z + \beta_2 Time_t + \beta_3\, Treatment_z * Time_t + \sum_{k=4}^{N} \beta_k X_k + \varepsilon_{it}$$

In the specified model, the subscript i denotes each individual Lady Health Worker (LHW), t signifies each time period (months), and z denotes the treatment status, wherein z equals 1 if the LHW received training and 0 otherwise. Where

1. $\boldsymbol{Y_{it}}$ represents our outcome variable for *i*th LHW at *t*th time period, the outcome variables are number of follow up clients, number of Intrauterine Contraceptive Devices (IUCD) clients, number of condom clients, number of modern methods clients and number of injection clients. Each outcome variable are representing monthly data for each LHW.
2. $\boldsymbol{\beta_0}$ represents the intercept, indicating the baseline level of the outcome variables when other covariates are set to zero.
3. $\boldsymbol{\beta_1}$ signifies the treatment effect, capturing the difference in outcomes between LHWs who received the intervention and those who did not.
4. $\boldsymbol{\beta_2}$ accounts for the temporal effect, representing the difference between the post-intervention and pre-intervention time periods.
5. $\boldsymbol{\beta_3}$ reflects the difference-in-differences estimate, indicating whether the intervention group exhibits a significant change in output over time compared to the control group.
6. $\boldsymbol{\beta_k}$ **r**epresents the coefficients for control variables, including LHW age, LHW education, eligible couples in the catchment area of each LHW and district variable.
7. $\boldsymbol{\varepsilon_{it}}$ is the random error term, accounting for unobserved variations not controlled for in the difference-in-differences regression.

4. Results

The results derived from the analysis of key variables, as detailed in Table 1, provide essential insights into the activities and outcomes associated with the Lady Health Workers (LHWs) under the DAFPAK-PSSD program.

Our dataset encompassed 12,690 observations, with the 'Treatment' variable indicating that approximately 53% of these observations represented the treated group, as evidenced by a mean value of 0.53. The 'Time' variable, with a mean of 0.33 and a standard deviation of 0.47, delineates the distribution of observations across the study timeline, highlighting that 33% of the data pertains to the post-intervention period, while the remaining 67% corresponds to the pre-intervention phase.

Furthermore, the monthly service data provides a granular view of the LHWs' service delivery metrics. On average across both treatment and control groups during the nine months, each LHW attends 15 intrauterine contraceptive device (IUCD) clients, 11 oral contraceptive pill clients, 42 condom users, 10 injectable contraceptive clients, and manages 110 clients utilizing modern contraceptive methods per month. In addition, the average monthly follow-up cases handled by each LHW amount to 109. Another pivotal metric is the average number of eligible couples within each LHW's catchment area, which stands at 239.

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Table 1. Summary Statistics.

Variables	N	Mean	SD	Min	Max
Treatment	12,690	0.53	0.50	0	1
Time	12,690	0.33	0.47	0	1
Months	12,690	5.00	2.58	1	9
District	12,690	3.78	1.67	1	6
Age	12,690	47.01	6.39	36	58
Education	12,690	11.74	1.09	10	14
IUCD Clients	12,690	15.39	10.68	0	50
Oral Pills Clients	12,690	10.64	9.78	0	50
Condoms Clients	12,690	42.19	23.31	0	100
Injections Clients	12,690	10.04	9.63	0	50
Modern Method Users	12,690	109.52	38.19	0	290
Follow Up Cases	12,690	108.62	37.60	0	200
Eligible Couples (15-49)	12,690	238.80	64.25	0	480

Table 2 presents the outcomes of the difference-in-differences regression analysis for five distinct outcome variables, demonstrating statistically significant coefficients for the difference-in-difference variable at a 95% confidence level across all outcomes.

Table 2. Difference in Difference Regression Results.

Variables	Follow Up Clients	IUCD Clients	Condom Clients	Modern Method Clients	Injection Clients
Treatment	1.33	-2.76***	6.55***	1.09	-2.54***
	(-0.42 - 3.08)	(-3.39 - -2.12)	(5.25 - 7.84)	(-0.69 - 2.86)	(-3.04 - -2.04)
Time	-1.18***	-0.34***	-0.51***	-1.27***	-0.07**
	(-1.41 - -0.94)	(-0.42 - -0.26)	(-0.66 - -0.36)	(-1.55 - -0.98)	(-0.13 - -0.01)
Treatment#Time	1.00***	0.23**	1.41***	1.82***	0.32***
	(0.30 - 1.70)	(-0.01 - 0.46)	(0.97 - 1.86)	(0.96 - 2.68)	(0.14 - 0.50)
Age	0.02**	0.00	0.01	0.00	0.00
	(0.00 - 0.04)	(-0.00 - 0.01)	(-0.00 - 0.02)	(-0.02 - 0.02)	(-0.00 - 0.01)
Education (Class 10)					
Class 11	0.02	0.04	0.09	0.39	0.06
	(-0.35 - 0.40)	(-0.09 - 0.17)	(-0.15 - 0.33)	(-0.08 - 0.85)	(-0.04 - 0.16)
Class 12	-0.11	0.01	-0.04	0.21	0.03
	(-0.45 - 0.23)	(-0.10 - 0.13)	(-0.26 - 0.17)	(-0.21 - 0.64)	(-0.06 - 0.12)
Class 14	-0.20	0.01	-0.06	0.25	0.06
	(-0.63 - 0.24)	(-0.14 - 0.16)	(-0.34 - 0.22)	(-0.28 - 0.79)	(-0.05 - 0.18)
Eligible Couples	0.36***	0.05***	0.14***	0.36***	0.03***
Catchment Area	(0.36 - 0.36)	(0.05 - 0.05)	(0.14 - 0.14)	(0.36 - 0.36)	(0.03 - 0.03)
District (Sheikhupura)					
Gujranwala	4.11***	-2.89***	9.73***	5.10***	0.03

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	(2.19 - 6.04)	(-3.59 - -2.19)	(8.31 - 11.16)	(3.16 - 7.04)	(-0.53 - 0.58)
Kasur	-7.76***	4.96***	-3.68***	-7.52***	-2.11***
	(-10.22 - -5.30)	(4.06 - 5.86)	(-5.50 - -1.86)	(-10.00 - -5.04)	(-2.81 - -1.40)
Layyah	3.81***	-0.22	-2.12**	4.22***	4.75***
	(1.52 - 6.10)	(-1.05 - 0.62)	(-3.82 - -0.42)	(1.91 - 6.54)	(4.09 - 5.41)
Muzaffargarh	15.21***	5.25***	-8.62***	15.83***	11.52***
	(13.36 - 17.07)	(4.58 - 5.93)	(-10.00 - -7.25)	(13.96 - 17.70)	(10.99 - 12.06)
Khanewal	-1.94**	-4.06***	-6.35***	-0.78	1.76***
	(-3.82 - -0.05)	(-4.75 - -3.37)	(-7.75 - -4.96)	(-2.68 - 1.13)	(1.22 - 2.31)
Constant	17.10***	4.33***	8.33***	17.73***	-0.46*
	(15.24 - 18.95)	(3.66 - 4.99)	(7.02 - 9.65)	(15.71 - 19.74)	(-0.98 - 0.06)
Observations	12,690	12,690	12,690	12,690	12,690
Number of id	1,410	1,410	1,410	1,410	1,410

CI in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

The results of the difference-in-differences regression, offer insightful revelations about the effect of the training program on LHWs' service delivery over time. The positive and statistically significant ($p<0.05$) coefficients across various service categories – Follow Up Clients [Coeff: 1.00, CI: (0.30 - 1.70)], IUCD Clients [Coeff: 0.23, CI: (-0.01 - 0.46)], Condom Clients [Coeff: 1.41, CI: (0.97 – 1.86)], Modern Method Clients [Coeff: 1.82, CI: (0.96 – 2.68)], and Injection Clients [Coeff: 0.32, CI: (0.14 – 0.50)]– indicate a notable increase in the effectiveness of the training program as time progressed. The regression results indicate that LHWs who underwent training were able to attend to one extra follow-up client, 0.23 additional clients seeking IUCD services, 1.41 more clients in need of condoms, 1.82 extra clients of modern contraceptive methods, and 0.32 more clients for injection services compared to LHWs who did not receive the training.. This suggests that the training had a progressively positive effect on the LHWs' ability to serve clients across these categories. Specifically, the increase in service delivery for condom and modern method clients is particularly pronounced, highlighting a successful augmentation in these areas post-training.

Conversely, the negative coefficients for the treatment effect on IUCD and injection clients suggest a decrease in these services immediately following the treatment, but the positive 'Treatment#Time' interaction indicates a gradual improvement over time. The temporal element, as captured by the 'Time' variable, also reveals a general downward trend in services, implying external factors influencing service delivery over the study period. Furthermore, the varying effects across different districts underscore the influence of local contexts on the outcomes. In summary, the training program's effect, as evidenced by the 'Treatment#Time' interaction, reveals a dynamic and evolving effect on LHWs' service provision.

5. Discussion

This study aimed to evaluate the effect of the training provided to Lady Health Workers (LHWs) in six districts of Punjab, Pakistan, under the DAFPAK-PSSD program, particularly focusing on family planning service delivery. The purpose was to gather evidence that could inform effective training programmes to improve family planning service delivery in the public sector. Our findings reveal a significant improvement in the performance of LHWs post-training, as evidenced by the positive and statistically significant coefficients in the 'Treatment#Time' interaction term across various service categories. These results resonate with the broader literature on the effectiveness of training healthcare workers in developing countries[13,14].

The significant positive changes in service delivery for condom and modern method clients align with studies from similar contexts. For example, a study in Ethiopia found that training health extension workers significantly improved their knowledge and practices in family planning services[15]. Similarly, research from Bangladesh reported enhanced competency in family planning

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service delivery among community health workers following targeted training[16]. These parallels suggest a consistent trend where focused training programs contribute to improved healthcare delivery in low-resource settings[17].

However, the initial decrease in services for IUCD and injection clients post-training, followed by a gradual improvement, requires further exploration. This pattern may be indicative of a learning curve, where LHWs initially struggle to integrate new skills into practice but improve over time, a phenomenon observed in other healthcare interventions[18,19].This highlights the importance of continuous support and monitoring post-training to ensure sustained improvement in service delivery.

The general downward trend in services, as indicated by the 'Time' variable, might reflect broader challenges in the healthcare sector, such as resource constraints or policy shifts, a common issue in many developing countries[20].This emphasizes the need for holistic approaches to healthcare improvement, beyond just training programs such as insuring commodity security, improving quality of care and addressing demand side barriers in accessing family planning services.

District-wise variations in service delivery underscore the importance of context-specific strategies. As evidenced in the literature, health interventions often require customization to local contexts for maximum effectiveness[21]. This is particularly relevant for diverse regions like Punjab, where demographic, cultural, and socio-economic factors vary significantly across districts.

Our study also supports the argument for continued investment in the training of community health workers as a cost-effective strategy to improve healthcare outcomes, especially in low-resource settings[22,23]. The LHW program in Pakistan, with its wide reach and potential for impact, exemplifies the utility of such grassroots initiatives in contributing to national health goals and the SDGs.

From a policy perspective, our findings advocate for sustained and enhanced training of LHWs on family planning, with a focus on ongoing support and refresher courses to ensure the long-term retention of skills and knowledge. Moreover, acknowledging the varying needs and challenges across different districts, policymakers should consider district-specific strategies in training and resource allocation.

Despite an average client served of 110 by each LHW, the unmet need for family planning services in Punjab, Pakistan, remains notably high. The study underscores the urgency to broaden the scope of family planning offerings and implement interventions aimed at increasing client engagement. Several factors contribute to the lower clientage of LHWs in the region, including limited awareness, cultural and social barriers, accessibility issues, and stigma surrounding family planning.

For future implementation, the study suggests integrating technological aids, such as mobile health (mHealth) applications, which have shown promise in enhancing healthcare delivery in similar contexts[24,25]. Such integrations could aid LHWs in maintaining records, following up with clients, and accessing up-to-date information on family planning methods.

In conclusion, the training of LHWs under the DAFPAK-PSSD program has demonstrated a positive effect on family planning service delivery in Punjab, Pakistan. This aligns with global evidence on the efficacy of training healthcare workers and highlights the necessity of continuous, context-specific training programs, integrated with broader healthcare strategies, to achieve sustainable improvements in health outcomes.

6. Limitations

However, it is imperative to acknowledge certain limitations inherent in the study. The research predominantly relies on observational data, and although concerted efforts have been made to control for various factors using the Difference-in-Differences (DiD) methodology, inherent biases may persist.

Moreover, it is crucial to note that the study's scope is confined to six districts in Punjab. While the findings provide valuable insights, generalizing them to other regions of Pakistan necessitates a

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cautious approach due to potential variations in healthcare infrastructure, demographics, and cultural factors.

Another notable limitation of the study lies in its omission of an assessment of the quality of care provided by the Lady Health Workers (LHWs). Instead, the study relies on self-reported numbers provided by LHWs to the Lady Health Supervisors (LHSs) for compilation before transmitting the data to the district team for uploading onto the Electronic Medical Records (EMR) portal. This reliance on self-reported data may introduce subjectivity and potential inaccuracies, raising concerns about the precision and reliability of the results. Additionally, a comprehensive evaluation of the qualitative aspects of care, including patient outcomes and satisfaction, would have provided a more nuanced understanding of the impact of the training on the overall healthcare delivery system.

7. Conclusions

In conclusion, this study has delved into the multifaceted landscape of family planning services in six districts of Punjab, Pakistan. Particularly focusing on the effect of a targeted training program for Lady Health Workers (LHWs) under the DAFPAK-PSSD initiative. With Pakistan being the world's fifth most populous country and facing rapid population growth, there is an urgent need to enhance family planning efforts to achieve national and global health goals. Despite political commitments and substantial resources allocated to family planning programs, the contraceptive prevalence rate (CPR) in Pakistan has remained stagnant.

Our study has utilized a robust methodology, employing a panel data difference-in-differences (DiD) approach, to assess the effect of the training on LHWs' performance. The results showcase statistically significant positive coefficients for key outcome variables, including follow up clients, IUCD clients, condom clients, modern method clients, and injection clients. These findings indicate that LHWs who underwent the training exhibited increased productivity and service delivery compared to their non-trained counterparts.

The positive outcomes observed in the study underscore the potential effectiveness of targeted training programs in revitalizing family planning efforts at the community level. Empowering LHWs with enhanced knowledge and skills not only contributes to the immediate improvement of service delivery but also aligns with the broader goals of elevating the national contraceptive prevalence rate. This research provides valuable insights for policymakers, public health practitioners, and program implementers, emphasizing the importance of continuous training and support for frontline health workers.

In conclusion, this study highlights effective strategies for enhancing family planning in developing countries. The success of the DAFPAK-PSSD training for LHWs emphasizes the need for customized interventions and continuous support for community health workers. Such initiatives are crucial in Pakistan's efforts to address population dynamics and promote sustainable maternal and child health improvements, aligning with broader Sustainable Development Goals.

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