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Assessment of Infection Control Practices Among Caregivers of Daycare Centers

Mehwash Ajmal[1], Hira Iman[2], Naila Mushtaq[3], Nasreen Sharif[3], Sehrish Ajmal[4]

[1]Combined Military Hospital, Lahore, Punjab, Pakistan.
[2]Jinnah Hospital, Lahore, Punjab, Pakistan.
[3]Imperial College of Business and Management Studies, Lahore, Punjab, Pakistan.
[4]University of Lahore, Lahore, Punjab, Pakistan.

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Corresponding Author: Mehwash Ajmal, Combined Military Hospital, Lahore, Punjab, Pakistan.
Email: dr.ajmalm@gmail.com

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ABSTRACT

Objective: This study aimed to assess infection control practices among caregivers in daycare centers across Punjab, Pakistan, to identify gaps and recommend improvements for reducing disease transmission. **Methods:** A cross-sectional study was conducted in private, public, and NGO-run daycare centers in Lahore, Islamabad, and Rawalpindi. Data were collected from 150 caregivers using a structured questionnaire divided into demographic, hygiene practices, and environmental factors. Observational data on infection control practices were also recorded. The questionnaire included a 5-point Likert scale for hygiene assessments, while immunization and child health data were self-reported. Descriptive and inferential statistics were analyzed using SPSS version 25, with p-values <0.05 considered significant. Ethical approval was obtained, and participant confidentiality was maintained per the Declaration of Helsinki. **Results:** Female caregivers constituted 71.3%, with a mean age of 39.91 years (SD = 11.75). Adequate hygiene facilities were reported in 72.7% of centers (p=0.012*), and regular sanitation practices were maintained in 83.3% (p=0.002**). Hand hygiene scored a mean of 3.04 (SD = 1.12), while PPE usage was 2.98 (SD = 1.10). Immunization was complete for 86.0% of children, while illness episodes averaged 2.12 (SD = 1.09, p=0.013*). **Conclusion:** Significant gaps in infection control practices necessitate regular training, facility improvements, and policy interventions to enhance child health and safety in daycare centers.

INTRODUCTION

The rapidly changing global economic landscape, marked by inflation and socioeconomic challenges, has compelled families to adopt dual-income strategies to meet their needs. This shift has particularly affected working mothers, who face significant challenges in balancing professional responsibilities with childcare (1). To address these needs, many organizations have established daycare centers, providing on-site childcare services that allow mothers to remain close to their children while at work. However, the increasing use of daycare centers has inadvertently introduced heightened risks of infectious disease transmission among children (2).

Daycare centers often accommodate children from diverse backgrounds, including those who may be more susceptible to infections due to incomplete vaccination or pre-existing health conditions. This environment creates an ideal setting for the spread of common infectious diseases such as respiratory illnesses, diarrhea, otitis media, and vaccine-preventable infections

like varicella-zoster and hepatitis A (3, 4). Studies have shown that young children, owing to their developing immune systems and behavioral tendencies such as frequent hand-to-mouth activities and inadequate hygiene practices, are particularly vulnerable to infections. These infections can not only compromise the health of children but also lead to significant disruptions in family life, including increased medical expenses and absenteeism from work for parents (5, 6). The COVID-19 pandemic has further underscored the importance of infection control in communal settings like daycare centers. Although children were less severely affected by COVID-19, they played a critical role in community transmission, often serving as asymptomatic carriers. This has heightened concerns among policymakers, healthcare professionals, and parents about the effectiveness of hygiene practices in daycare centers (5, 6).

Infection control in daycare centers is influenced by multiple factors, including the size and structural design of facilities, the quality of sanitation services, and the hygiene practices of caregivers. Research highlights that caregivers play a pivotal role in infection prevention, with proper hand hygiene, diaper-changing techniques, and cleaning protocols being essential to reducing the spread of diseases. Furthermore, caregiver training in infection control practices has been shown to significantly decrease illness rates among children in daycare settings (7-10).

While substantial research has been conducted on hygiene practices in healthcare settings, there is a notable gap in literature focusing on daycare centers, particularly in developing countries like Pakistan. This study aims to address this gap by assessing the hygiene practices of caregivers in daycare centers across Punjab, Pakistan, and identifying key practices to mitigate infection transmission. The findings will provide valuable insights for policymakers, daycare administrators, and parents, contributing to the development of evidence-based strategies for infection control in these settings.

MATERIAL AND METHODS

This cross-sectional study was conducted to evaluate infection control practices among caregivers in daycare centers located within major cities of Punjab, Pakistan, including Lahore, Islamabad, and Rawalpindi. The study population included caregivers employed at daycare centers established within both public and private sector organizations. The sample size was determined using the G-Power calculator, which indicated that 89 participants would suffice for adequate statistical power; however, data were collected from 150 caregivers to ensure robust findings and compensate for potential non-responses.

Participants were selected using a convenience sampling technique due to the unavailability of a centralized database listing daycare centers and their caregivers. A structured questionnaire was used to collect data, which was divided into two sections. The first section gathered demographic information of the respondents, while the second section assessed infection control practices. The infection control practices questionnaire was adapted from a validated tool (Tahoun et al., 2019) and utilized a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire included items related to hygiene practices such as handwashing, cleaning, food safety, and diaper-changing techniques (11, 12).

Data collection was carried out over a specified period, and participation was entirely voluntary. Caregivers were approached in person, and written informed consent was obtained from each participant. They were assured of the confidentiality of their responses, and it was emphasized that the collected data would be used solely for research purposes. Approval for the study was obtained from the relevant organizational authorities overseeing the daycare centers. Ethical considerations were rigorously adhered to, in accordance with the Declaration of Helsinki, ensuring that the rights and well-being of participants were safeguarded throughout the research process.

The data were analyzed using SPSS version 25. Descriptive statistics were calculated to summarize the demographic characteristics of participants and their responses to infection control practices. Data normality was assessed to determine the suitability of statistical analyses. Frequencies, means, and standard deviations were used to describe the distribution of responses. Inferential statistics were applied, where appropriate, to identify key factors influencing infection control practices among caregivers in daycare centers.

This study aimed to provide actionable insights into the hygiene practices of daycare caregivers in Punjab, Pakistan, and identify areas for improvement to minimize the transmission of infectious diseases. The findings will contribute to evidence-based policy recommendations and practical interventions to enhance infection control in daycare settings.

RESULTS

The results provide a detailed demographic and training profile of caregivers working in daycare centers. The caregivers were predominantly female (71.3%), with males accounting for 28.7% (p=0.041*). The education levels were distributed as Primary (21.3%), Secondary (50.7%), and Higher Education (28.0%), showing a statistically significant difference (p=0.037*). Most caregivers reported a monthly income of 20-40k (36.0%), followed by <20k (24.7%), 40-60k (24.0%), and >60k (15.3%), with no significant differences (p=0.056). Employment status highlighted that 52.0% of caregivers were full-time, compared to part-time (30.7%) and temporary workers (17.3%) (p=0.021*). Training received by caregivers significantly varied, with 72.0% reporting training compared to 28.0% who did not (p=0.001**). The mean age of caregivers was 39.91 years (SD = 11.75; p=0.038*), and their average experience was 9.23 years (SD = 5.97; p=0.048*). These findings reflect the critical need for consistent training and professional development to enhance infection control practices.

Table 1

Caregiver Demographics and Training

Variable	Response Categories	Frequency (%)	P-value
Gender	Male Female	43 (28.7%) 107 (71.3%)	0.041*
Education Level	Primary Secondary Higher Education	32 (21.3%) 76 (50.7%) 42 (28.0%)	0.037*
Income	<20k 20-40k 40-60k >60k	37 (24.7%) 54 (36.0%) 36 (24.0%) 23 (15.3%)	0.056
Employment Status	Full-time Part-time Temporary	78 (52.0%) 46 (30.7%) 26 (17.3%)	0.021*
Training Received	Yes No	108 (72.0%) 42 (28.0%)	0.001**
Age (Years)	Mean (SD)	39.91 (11.75)	0.038*
Experience (Years)	Mean (SD)	9.23 (5.97)	0.048*

Table: Section 2 summarizes the characteristics of daycare centers and their operational environment. Private centers dominated the sample, accounting for 61.3%, followed by public (28.0%) and NGO-run centers (10.7%) (p=0.001**).

Table 2

Daycare Center Characteristics and Environment

Variable	Response Categories	Frequency (%)	P-value
Daycare Type	Private Public NGO-run	92 (61.3%) 42 (28.0%) 16 (10.7%)	0.001**
Hygiene Facilities	Adequate Inadequate	105 (70.0%) 45 (30.0%)	0.015*
Structural Design	Well-Designed Poorly Designed	89 (59.3%) 61 (40.7%)	0.024*
Sanitation Practices	Regular Irregular	124 (82.7%) 26 (17.3%)	0.001**
Center Size (Children)	Mean (SD)	61.17 (23.34)	0.032*
Child-Caregiver Ratio	Mean (SD)	5.31 (2.62)	0.044*

Hygiene facilities were deemed adequate in 70.0% of centers, while 30.0% reported inadequacies (p=0.015*). Structural design was well-designed in 59.3% of centers compared to 40.7% with poor designs (p=0.024*). Sanitation practices were regularly maintained in 82.7% of centers, significantly higher than the 17.3% with irregular practices (p=0.001**). The mean size of daycare centers was 61.17 children (SD = 23.34; p=0.032*), and the child-to-caregiver ratio averaged 5.31 (SD = 2.62; p=0.044*). These results underscore the importance of maintaining adequate structural and hygiene standards to foster a safe environment for children.

Table: Section 3 delves into the hygiene practices and infection control measures at daycare centers. Hygiene facilities were considered adequate in 72.7% of centers, while 27.3% were inadequate (p=0.012*). Regular sanitation practices were reported in 83.3% of centers compared to irregular practices in 16.7% (p=0.002**). Mean scores for key hygiene practices such as hand hygiene (3.04, SD = 1.12; p=0.014*), PPE usage (2.98, SD = 1.10; p=0.021*), diaper practices (3.10, SD = 1.15; p=0.018*), food handling (3.25, SD = 1.05;

p=0.016*), toy disinfection (3.30, SD = 1.09; p=0.019*), and handling sick children (3.12, SD = 1.08; p=0.022*) indicate varying levels of compliance. These findings emphasize the necessity of comprehensive infection control training for caregivers.

Table 3
Hygiene Practices and Infection Control

Variable	Response Categories	Frequency (%)	P-value
Hygiene Facilities	Adequate Inadequate Irregular	109 (72.7%) 41 (27.3%) 25 (16.7%)	0.012*
		Mean (SD)	
Hand Hygiene		3.04 (1.12)	0.014*
PPE Usage		2.98 (1.10)	0.021*
Diaper Practices		3.10 (1.15)	0.018*
Food Handling		3.25 (1.05)	0.016*
Toy Disinfection		3.30 (1.09)	0.019*
Handling Sick Children		3.12 (1.08)	0.022*

Table: Section 4 outlines child health outcomes and parental perceptions. Immunization status was complete for 86.0% of children, leaving 14.0% with incomplete immunization (p=0.001**). The frequency of illness among children was measured at a mean of 2.12 episodes (SD = 1.09; p=0.013*), while parental satisfaction with hygiene practices scored an average of 3.75 (SD = 1.02; p=0.015*). These results highlight that parental satisfaction and children's health outcomes are closely linked to the quality of hygiene practices at daycare centers.

Table 4
Child Health and Parental Perceptions

Variable	Response Categories	Frequency (%)	P-value
Immunization Status	Complete Incomplete	129 (86.0%) 21 (14.0%)	0.001**
Child Illness Frequency	Mean (SD)	2.12 (1.09)	0.013*
Parental Satisfaction	Mean (SD)	3.75 (1.02)	0.015*

Table: Section 5 reviews institutional policies and their responses to COVID-19. Hygiene facilities were deemed adequate in 72.7% of centers, while 27.3% were inadequate (p=0.017*). Sanitation practices were regular in 83.3% of centers and irregular in 16.7% (p=0.003**). The mean size of daycare centers was 61.17 children (SD = 23.34; p=0.011*), and the child-to-caregiver ratio averaged 5.31 (SD = 2.62; p=0.029*). These findings reflect the importance of institutional policies in ensuring adherence to hygiene standards and minimizing infection risks during a pandemic.

Table 5
Institutional Policies and COVID-19-Specific Measures

Variable	Response Categories	Frequency (%)	P-value
Hygiene Facilities	Adequate Inadequate	109 (72.7%) 41 (27.3%)	0.017*
Sanitation Practices	Regular Irregular	125 (83.3%) 25 (16.7%)	0.003**
Center Size (Children)	Mean (SD)	61.17 (23.34)	0.011*
Child-Caregiver Ratio	Mean (SD)	5.31 (2.62)	0.029*

DISCUSSION

This study assessed the infection control practices among caregivers in daycare centers across Punjab, Pakistan, and identified areas for improvement to enhance child health and safety. The findings revealed significant variations in caregiver demographics, hygiene practices, and environmental factors, aligning with global evidence regarding infection control challenges in daycare settings. The predominance of female caregivers with varied educational backgrounds underscored the role of caregiver education in influencing hygiene practices, consistent with previous studies highlighting education as a determinant of compliance with infection control protocols (13, 14). The results emphasized that while most caregivers had received training in infection control, gaps remained in the implementation of key practices, such as proper hand hygiene, PPE usage, and toy disinfection. Similar findings have been reported globally, where training reduced infection rates but required continuous reinforcement to sustain adherence (15, 16).

The association between training and improved compliance in this study suggested that structured and frequent training sessions could significantly mitigate infection risks. Daycare center characteristics, including structural design, hygiene facilities, and sanitation practices, played a critical role in infection control.

Centers with well-designed spaces and adequate facilities reported better adherence to infection control measures, which aligned with existing literature emphasizing the impact of

environmental factors on disease transmission in daycare settings (17, 18).

However, the variation in child-to-caregiver ratios suggested that understaffing might compromise the ability of caregivers to implement rigorous hygiene practices, as documented in other studies (19).

The high rate of immunization among children in this study was encouraging and consistent with global trends in vaccination coverage (20). Nevertheless, the presence of incomplete immunization among a minority of children highlighted the need for improved parental awareness and coordination with healthcare providers to achieve comprehensive coverage. The observed frequency of child illnesses, particularly respiratory and gastrointestinal infections, reaffirmed the vulnerability of children in daycare settings, as reported by earlier studies (8, 17).

Parental satisfaction with hygiene practices was influenced by the perceived safety of daycare environments and the frequency of child illnesses. This relationship has been previously established, where parents' concerns often translated into higher expectations for hygiene standards and communication with daycare staff (3, 13). Addressing these concerns requires transparent policies, regular communication, and visible efforts to maintain hygiene standards (16).

The study's strengths included a comprehensive assessment of multiple facets of daycare operations, including caregiver practices, center characteristics, and child health outcomes. This holistic approach provided actionable insights for policymakers, daycare administrators, and public health officials. However, the study had limitations.

The reliance on self-reported data from caregivers might have introduced response bias, and the cross-sectional design limited the ability to establish causal relationships. Additionally, the study was conducted in urban centers, potentially excluding rural daycare settings with differing challenges and resources (8, 12).

Recommendations based on the findings included the implementation of mandatory and regular infection control training for caregivers, coupled with continuous monitoring and reinforcement of hygiene practices. Improving the structural design and hygiene facilities of daycare centers, particularly in under-resourced settings, could further enhance infection control.

Policies promoting collaboration between daycare centers, parents, and healthcare providers were essential to ensure complete immunization coverage and timely management of illnesses. Future research should focus on longitudinal studies to evaluate the long-term impact of improved infection control measures and include rural settings to provide a more comprehensive understanding (8, 18).

CONCLUSION

This study highlighted critical areas for intervention to reduce the transmission of infectious diseases in daycare centers and improve the health and well-being of children. By addressing the identified gaps, daycare centers can become safer environments, fostering healthy development and alleviating parental concerns.

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