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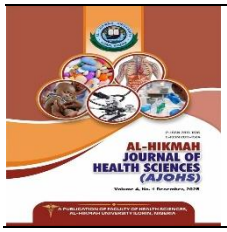

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Original Article

Educational Level as a Determinant of Infection Control Compliance Among Body Modification Practitioners in Osun State, Nigeria

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ABSTRACT

Introduction: Infection control compliance within body modification practice remains a significant public health concern due to the risk of transmitting blood-borne and skin infections. Despite increasing regulatory attention, substantial variability in compliance persists, suggesting that structural determinants warrant closer examination. This study investigated educational level as a determinant of infection control knowledge, attitudes, and practices among body modification practitioners.

Methods: A cross-sectional study involving 59 practitioners was conducted at Ijebu-Jesa and Ede, Osun State. Data was collected using a structured questionnaire measuring educational attainment alongside composite scores for infection control knowledge, attitudinal orientation, and self-reported practices. Descriptive statistics and inferential analyses, including one-way analysis of variance, were used to examine associations between educational level and outcome variables.

Results: The findings revealed a pronounced educational gradient across all domains. Mean knowledge scores increased from 0.00 among practitioners with no formal education to 5.86 among those with tertiary education. Attitudinal scores similarly improved with educational attainment, with higher-educated practitioners demonstrating more precautionary and consistent orientations towards infection control, reflected in higher median scores and reduced score dispersion. Practice outcomes showed the strongest educational effect, with mean practice scores rising from 14.86 among practitioners with primary education to 28.57 among those with tertiary education. Differences in practice scores at $F = 9.037$, $p < .001$ across educational categories were statistically significant.

Conclusion: These findings indicated that education is a central structural determinant of infection control compliance, influencing knowledge acquisition, risk appraisal, and behavioural enactment. The study revealed the limitations of approaches that prioritise regulation or procedural training alone and highlights the need to integrate educational considerations into infection control policy, training frameworks, and professional development strategies within the body modification sector.

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Introduction

Body modification practices, including tattooing, piercing, and related procedures, involve intentional disruption of the skin barrier and are therefore inherently associated with infection risk (Hayes & Harkness, 2001). The invasive nature of these Practices create direct pathways for microbial transmission when aseptic techniques are inadequately applied (Zhou *et al*., 2014). Research has demonstrated that such procedures can facilitate the transmission of blood-borne pathogens, including hepatitis B virus and hepatitis C virus, particularly in contexts where infection prevention protocols are inconsistently implemented (Hellard *et al*., 2003). Further epidemiological evidence indicates that unsafe body modification practices may also contribute to the spread of human immunodeficiency virus in high-risk settings (Jafari *et al*., 2012).

A growing body of literature has linked adverse health outcomes in body modification contexts to deficiencies in infection control practices. Inadequate sterilisation of reusable instruments has been identified as a significant risk factor for bacterial and viral contamination (De Cuyper *et al*., 2017). Inconsistent use of personal protective equipment, particularly disposable gloves, further exacerbates exposure risks for both practitioners and clients (Lehmann *et al*., 2010). Poor waste management practices, including unsafe disposal of sharps and contaminated materials, have also been shown to increase occupational and environmental health hazards within these settings (Kluger et al., 2019). These indicate that infection-related harms in body modification practice are not isolated incidents but reflect systemic failures in compliance with standard precautions.

Despite increased awareness of infection risks, compliance with infection control guidelines within the body modification sector remains uneven. Comparative analyses across regulatory environments demonstrate substantial variability in licensing requirements, inspection regimes, and mandatory training provisions (ECDC, 2015). In jurisdictions where regulatory oversight is limited, practitioners often enter the profession through informal or apprenticeship-based learning pathways, which may prioritise technical skill acquisition over comprehensive infection prevention education (Thompson & McCracken, 2014). This variability raises critical questions about the structural and educational factors that shape practitioners' capacity to implement effective infection control measures consistently.

Crucially, existing research suggests that access to resources alone does not fully explain differences in compliance behaviour. Studies conducted in both regulated and semi-regulated contexts have demonstrated that practitioners with similar material conditions may exhibit markedly different infection control practices (Lehmann *et al*., 2010). Such findings point to the importance of individual-level determinants, including educational attainment, in shaping infection control knowledge, attitudes, and practices. Education has been widely recognised as a key determinant of health literacy and professional judgement, influencing individuals' ability to interpret guidelines, assess risk, and translate knowledge into consistent practice (Nutbeam, 2008). However, the mechanisms through which educational level influences infection control compliance among body modification practitioners remain underexplored.

This study addresses this gap by examining educational level as a determinant of infection-control knowledge, attitudes, and practices among body-modification practitioners. Specifically, the study seeks to analyse the relationship between educational attainment and practitioners' knowledge of infection prevention principles, their attitudes towards infection control compliance, and their self-reported infection control practices. Using a knowledge–attitude–practice framework, the research seeks to clarify whether education functions merely as a source of information or as a broader structural enabler of compliant professional behaviour. Understanding this relationship is essential for informing evidence-based training standards, regulatory policies, and public health interventions aimed at reducing infection-related risks within the body modification sector.

Methodology

Study Design

A quasi-experimental design was employed to assess variations in infection control knowledge, attitudes, and practices across different educational levels. This design facilitated the simultaneous measurement of independent and dependent variables, allowing for statistical comparison between educational categories (Setia, 2016). While quasi-experimental designs do not permit causal inference, they are well suited to identifying patterns and associations that can inform theory development and future longitudinal research (Levin, 2006). The design was therefore appropriate for the study's aim of examining education as a determinant rather than a causal mechanism of compliance behaviour.

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Study Population and Setting
The study population comprised body modification practitioners engaged in tattooing, piercing, and related procedures within Ijebu-Jesa and Ede, Osun State. Inclusion criteria required participants to be actively practicing at the time of data collection and to have direct responsibility for performing invasive procedures. Practitioners who were not involved in procedural work or who declined informed consent were excluded from the study. The setting was characterized by mixed regulatory oversight, encompassing both formally registered studios and semi-regulated practice environments. This diversity was considered essential for capturing variability in educational background and professional experience.

Data Collection Instruments
Data were collected using a structured, self-administered questionnaire comprising four sections: sociodemographic characteristics, infection control knowledge (15 items), attitudes toward infection prevention (10 items), and self-reported infection control practices (12 items). The instrument was adapted from previously validated infection control questionnaires and contextualised for body modification practice (Askarian et al., 2007). Knowledge items assessed sterilisation principles, pathogen transmission, and standard precautions, while attitude and practice items evaluated perceptions of infection risk, professional responsibility, use of personal protective equipment, equipment sterilisation, and waste disposal practices.
Content and face validity were established through expert review and pilot testing among practitioners outside the study sample. Internal consistency was assessed using Cronbach's alpha coefficients, which demonstrated acceptable reliability for the knowledge ($\alpha = 0.81$), attitude ($\alpha = 0.84$), and practice ($\alpha = 0.79$) domains, indicating satisfactory psychometric robustness of the instrument.

Sample Recruitment Strategy and Recruitment
Participants were recruited through field visits to tattoo studios and body piercing outlets in Ijebu-Jesa and Ede Local Government Areas of Osun State, Nigeria. Eligible practitioners actively engaged in tattooing or body piercing were approached directly, informed about the study objectives, and invited to participate. Only individuals willing to complete both baseline and end-line assessments were enrolled following informed consent.

Sampling Technique
A purposive sampling approach combined with snowball recruitment was employed to identify eligible participants actively engaged in tattooing and body piercing within the study locations. Initial participants were identified through local networks and studio visits, after which additional practitioners were recruited via peer referral. This approach was appropriate given the informal and unregistered nature of the industry.

Variables and Measurement
Educational level was treated as the independent variable and categorised according to the highest level of formal education attained. Dependent variables comprised infection control knowledge scores, attitude scores, and practice scores derived from aggregated questionnaire responses. Knowledge scores reflected the number of correct responses to factual items, while attitude and practice scores were calculated using composite indices based on Likert-type and frequency-based items, respectively. This operationalisation enabled quantitative comparison across educational categories while preserving conceptual distinctions between knowledge, attitudes, and practices, consistent with knowledge–attitude–practice frameworks.

Data Analysis
Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were used to summarise sociodemographic characteristics and the distribution of key variables. Inferential analyses were performed to examine associations between educational level and infection control outcomes. Chi-square tests were used to assess relationships between categorical variables. Statistical significance was determined using conventional probability thresholds. Analytical procedures were selected to ensure robustness and alignment with the study objectives, while minimizing the risk of spurious associations.

Ethical Considerations
Ethical approval for this study was obtained from the Osun State Health Research Ethical Committee, with approval number OSHREC/PRS/569T/579 prior to data collection. Participation was voluntary, and informed consent was obtained from all respondents. Anonymity and confidentiality were maintained throughout the research process, and data were used solely for academic purposes in accordance with ethical research standards (World Medical Association, 2013).

Results
Sociodemographic Characteristics of Participants
A total of 59 practitioners participated in the study. The sample comprised individuals engaged primarily in

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tattooing, piercing, or combined body modification practices. Educational attainment varied considerably across participants, ranging from completion of primary education to post-secondary qualifications. The distribution of educational levels is presented in Table 1, which provides an overview of key demographic characteristics relevant to the analysis.

Table 1. Sociodemographic Profile of Study Participants (N = 59)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	25	42.4
	Female	34	57.6
Ever Had Training	Yes	43	72.9
	No	16	27.1
Highest Educational Level Attained	None	2	3.4
	Primary education	14	23.7
	Secondary education	36	61.0
	Tertiary education	7	11.9
Services Rendered	Tattooing only	4	6.8
	Body piercing only	48	81.4
	Combined practice	7	11.9

The mean age of participants was 28.31 years (SD = 6.72), and the mean duration of professional experience was 6.78 years (SD = 5.24). Percentages are calculated using the total sample size of 59. As shown in Table 1, the largest proportion of participants reported secondary-level education, followed by those with post-secondary qualifications, while a smaller proportion had completed only primary education. Years of professional experience ranged widely, indicating a heterogeneous sample in terms of occupational tenure. This diversity provided a suitable basis for examining associations between educational level and infection control outcomes across differing professional backgrounds.

Educational Level and Infection Control Knowledge

Infection control knowledge scores varied significantly across educational categories. Mean knowledge scores increased progressively with higher levels of educational attainment, indicating a clear gradient effect. This pattern is illustrated in Figure 1.

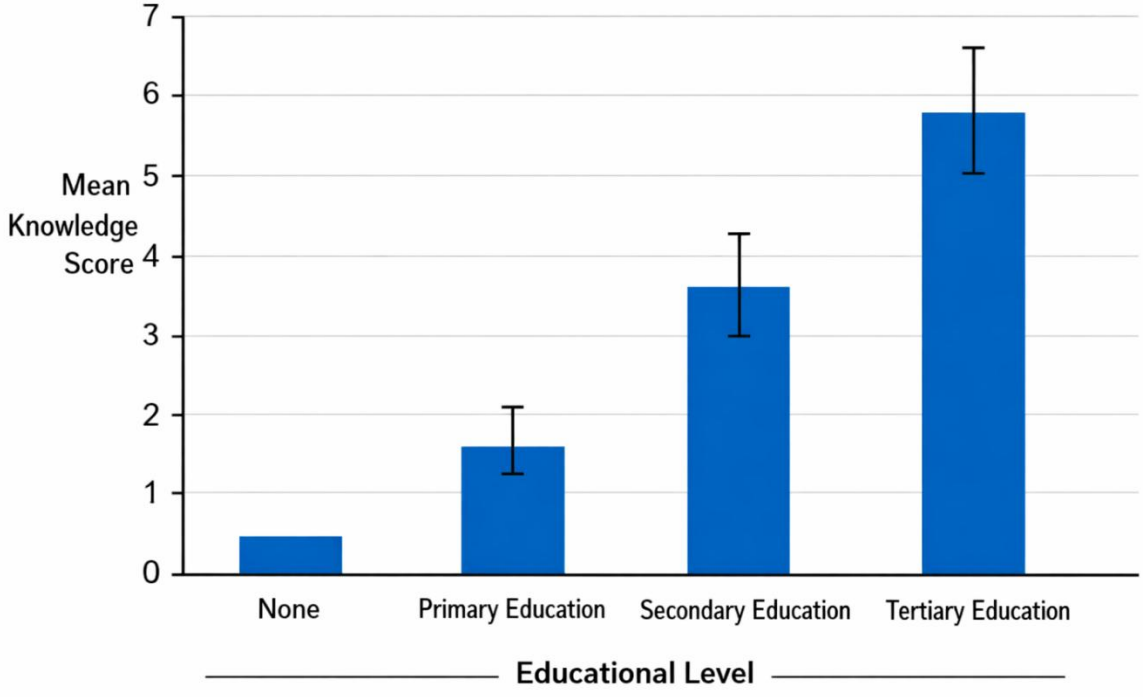

Figure 1. Mean infection control knowledge scores by educational level

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As shown in Figure 1, practitioners with post-secondary education achieved the highest mean knowledge scores, while those with primary-level education recorded the lowest. Higher-educated practitioners demonstrated greater accuracy in identifying correct sterilisation procedures, modes of pathogen transmission, and appropriate use of personal protective equipment. Inferential analysis confirmed that differences in knowledge scores across educational levels were statistically significant, indicating a robust association between educational attainment and infection control knowledge.

Educational Level and Attitudinal Orientation towards Infection Control

Attitudinal scores reflected practitioners' perceptions of infection risk, perceived importance of compliance, and sense of professional responsibility. Analysis revealed systematic variation in attitudinal orientation across educational levels. This distribution is illustrated in Figure 2.

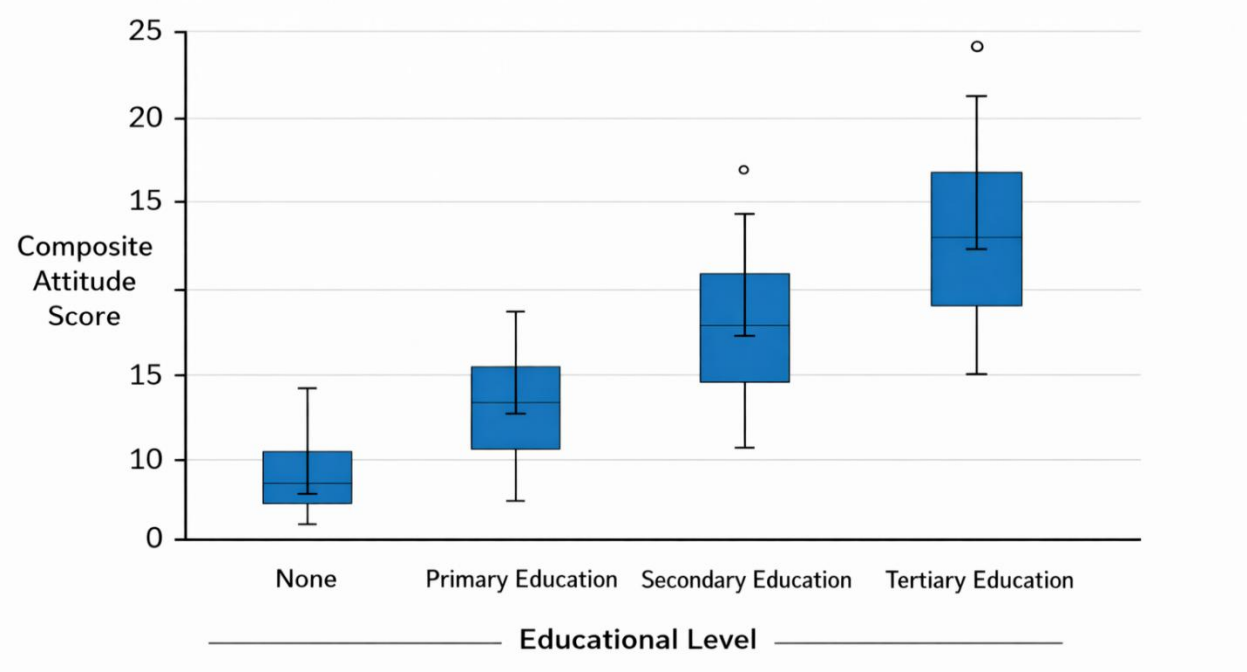

Figure 2. Distribution of Infection Control Attitude Scores by Educational Level

As indicated in Figure 2, practitioners with higher educational attainment exhibited more favorable attitudes towards infection control, characterized by stronger agreement with the importance of strict adherence to guidelines and heightened awareness of occupational risk. In contrast, lower educational levels were associated with more variable and, in some cases, less precautionary attitudinal profiles. Statistical testing demonstrated a significant association between educational level and attitude scores, supporting the presence of an education-related gradient in infection control attitudes.

Educational Level and Infection Control Practices

Self-reported infection control practices also differed markedly according to educational attainment. Compliance behaviours examined included routine equipment sterilisation, consistent glove use, safe disposal of sharps, and maintenance of hygienic work environments. The association between educational level and reported practices is summarised in Table 2, which presents comparative compliance rates across educational categories.

Table 2. Association Between Educational Level and Infection Control Practices

Educational Level	Mean Practice Score	Standard Deviation (SD)	F value	df	p-value
None	22.00	2.83			
Primary education	14.86	4.17			
Secondary education	17.67	6.14			
Tertiary education	28.57	7.81	9.037	3	< .001

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As shown in Table 2, practitioners with higher educational attainment reported significantly higher compliance rates across all measured practices. Practice scores were derived from a composite scale assessing adherence to infection control measures, including hand hygiene, glove use, sterilisation practices, and waste disposal. Higher scores indicate greater compliance with infection control practices. Statistical significance was determined using ANOVA. The greatest disparities were observed in practices requiring procedural judgement, such as sterilisation validation and waste management, rather than in more visible practices such as glove use. Regression analysis further indicated that educational level remained a significant predictor of infection control practice scores after controlling for demographic variables and years of professional experience, suggesting that educational attainment is independently associated with practical compliance behaviour.

Discussion

The association between educational level and infection control knowledge was both pronounced and statistically robust. As illustrated in Figure 1, mean knowledge scores increased progressively across educational categories, from a mean score of 0.00 among practitioners with no formal education to 5.86 among those with tertiary education. This substantial difference indicates that educational attainment is strongly linked to practitioners' ability to correctly identify sterilization procedures, transmission pathways of blood-borne pathogens, and principles of standard precautions. These findings are consistent with evidence demonstrating that higher education enhances health literacy, critical reasoning, and the capacity to interpret technical guidance (Nutbeam, 2008).

However, the results also suggest that knowledge acquisition alone does not fully explain compliance behaviour. Educational level was equally associated with attitudinal orientation towards infection control. Figure 2 demonstrates a clear shift in median attitude scores with increasing education, alongside reduced score dispersion among tertiary-educated practitioners. This pattern indicates not only more favourable attitudes but greater consistency in risk appraisal within higher educational categories. Such findings align with behavioural theory, which emphasises that education shapes evaluative judgement, perceived severity of risk, and professional responsibility (Ajzen, 1991; McEachan *et al*., 2016). This challenges assumptions that non-compliance reflects indifference to safety, instead suggesting that limited education may constrain practitioners' ability to accurately perceive infection risk and its consequences.

The relationship between educational level and infection control practices further reinforces the centrality of education as a determinant of behaviour. As shown in Table 2, mean practice scores varied significantly by educational level, with tertiary-educated practitioners achieving a mean score of 28.57 compared with 14.86 among those with primary education. ANOVA confirmed that these differences were statistically significant ($F = 9.037$, $p < .001$). Notably, the greatest disparities were observed in practices requiring procedural judgement, such as sterilisation validation and waste disposal, rather than in more routine behaviours. This distinction is critical, as it suggests that education supports adaptive application of infection control principles rather than rote compliance alone.

The findings are broadly consistent with research conducted in healthcare and occupational health settings, where higher educational attainment has been repeatedly associated with improved adherence to infection prevention protocols. Studies of nurses and allied health professionals have shown that advanced education predicts superior infection control knowledge and more precautionary attitudes, even when controlling for professional experience and resource availability (Gershon *et al*., 2000; Askarian *et al*., 2007). The present study extends these findings to the body modification sector, demonstrating that educational mechanisms operate similarly despite differences in professional regulation and training pathways.

However, the findings also diverge from the literature that emphasises regulation and enforcement as primary drivers of compliance. Although regulatory oversight is important, the persistence of substantial variability in knowledge, attitudes, and practices within the same regulatory context observed in this study mirrors previous research indicating that regulation alone is insufficient to ensure safe practice (Lehmann *et al*., 2010; De Cuyper *et al*., 2017). The present findings suggest that education may mediate the effectiveness of regulation by influencing practitioners' capacity to internalize, interpret, and enact infection control guidelines meaningfully.

Comparatively, research focusing on informal or apprenticeship-based training has often attributed compliance deficits to a lack of standardisation (Kluger *et al*., 2019). While this study does not discount the importance of structured training, the magnitude of differences observed between educational categories suggests that short-term infection control courses may be inadequate

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substitutes for broader educational development. This challenges assumptions that procedural training alone can compensate for foundational educational disparities and underscores the need to consider education as a long-term determinant of professional behaviour.

From a theoretical perspective, the findings support conceptualisations of education as a structural enabler of compliance rather than a discrete informational input. Education appears to influence infection control behaviour through multiple pathways, including enhanced cognitive processing, greater self-efficacy, and stronger alignment with professional norms. These mechanisms are consistent with social cognitive theory, which emphasises the role of perceived competence and outcome expectations in behavioural regulation (Bandura, 2004).

The findings also highlight limitations of knowledge–attitude–practice models when applied uncritically. While the observed associations support the interrelated nature of knowledge, attitudes, and practices, the consistent influence of educational level across all three domains suggests that KAP models may underestimate the role of upstream structural determinants (Launiala, 2009). Education does not simply initiate a linear progression from knowledge to practice; rather, it shapes the cognitive and normative environment within which practitioners operate. This insight has important implications for both theoretical refinement and intervention design.

Implications for Policy and Professional Practice

The findings have significant implications for infection control policy and professional development within the body modification sector. Interventions that focus solely on procedural training or regulatory enforcement may fail to address underlying educational disparities that constrain compliance capacity. The substantial differences in mean knowledge and practice scores observed between educational categories indicate that practitioners with lower educational attainment may require more intensive, cognitively supportive interventions to achieve sustained behavioural change.

Incorporating minimum educational requirements into licensing frameworks, or embedding infection control education within broader educational pathways, may enhance the effectiveness of existing regulatory measures. Additionally, infection prevention programmes should be designed to account for variation in educational background, aligning content and pedagogical approaches with practitioners' cognitive capacities. Evidence from health education research suggests that interventions grounded in learners' educational context are more likely to produce durable improvements in compliance behaviour (McEachan *et al*., 2016).

Conclusion

This study demonstrates that educational level is a significant determinant of infection control knowledge, attitudes, and practices among body modification practitioners, addressing an important gap in the existing literature. Higher educational attainment was consistently associated with greater knowledge accuracy, more precautionary attitudinal orientations, and stronger adherence to infection prevention practices, indicating that education functions as a core structural determinant of compliance rather than a peripheral demographic factor. The findings suggest that education influences compliance through multiple interrelated mechanisms, including enhanced cognitive capacity, more accurate risk appraisal, and stronger alignment with professional norms. In doing so, the results challenge dominant narratives that frame non-compliance primarily as a consequence of regulatory weakness, insufficient enforcement, or individual negligence. Instead, the study highlights the role of educational inequities in shaping practitioners' ability to interpret, internalise, and consistently apply infection control guidance. The findings also draw attention to the limitations of knowledge–attitude–practice models when the educational context is insufficiently considered, as such frameworks may underestimate the influence of upstream structural determinants. Collectively, these results have important implications for infection control policy and professional training, underscoring the need to integrate educational considerations into regulatory frameworks and intervention design to support sustained compliance and improved public health protection.

Limitations of the Study

Despite the study's analytical rigour, several limitations warrant consideration. Reliance on self-reported practices may have introduced social desirability bias, potentially overstating compliance with visible infection control measures. The study design limits causal inference, as the temporal direction between education and compliance cannot be established. Additionally, the focus on a specific practice context may restrict generalisability to settings with different regulatory or cultural conditions. Finally, unmeasured factors such as peer norms, studio culture, and economic pressures may have influenced behaviour. These limitations highlight the need for cautious interpretation and further longitudinal research.

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