



Awareness of Bacterial Contamination and Hygiene Practices among Motorcycle Taxi Users in a Health-Allied Student Population

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Abstract

The increasing use of motorcycle taxi services in Metro Manila has raised public health concerns regarding shared passenger helmets, which may serve as fomites for bacterial contamination because of repeated contact with users' scalp, hair, skin, and facial areas. This study examined the awareness of bacterial contamination and hygiene practices among motorcycle taxi users in a health-allied student population. Using a quantitative descriptive-correlational design, the study surveyed 145 third-year Medical Technology and Nursing students from Centro Escolar University-Manila through a validated online questionnaire. Data were analyzed using descriptive statistics, Spearman's rank-order correlation, Pearson's r as a reference value, and independent-samples t -tests. Findings showed that respondents had very high awareness of bacterial contamination risks associated with shared motorcycle taxi helmets, with an overall awareness mean of 3.45. Hygiene practices were also generally high, with an overall mean of 3.60, although direct sanitization behaviors remained inconsistent. The greatest reported challenges were the lack of hygiene regulations or enforcement and poor or irregular helmet sanitation by operators. A significant moderate positive relationship was found between awareness and hygiene practices, $p = .357$, $p < .001$. Female respondents reported significantly higher awareness than males, while no significant differences were found between Medical Technology and Nursing students. The findings suggest that awareness contributes to hygiene behavior but is insufficient when structural barriers remain. Stronger sanitation protocols, passenger education, and regulatory standards for shared helmet use are recommended.

Keywords: *bacterial contamination; hygiene practices; motorcycle taxi users; shared helmets; health-allied students; public health*

1. Introduction

Urban transportation in Metro Manila continues to be shaped by persistent traffic congestion, limited mass transit capacity, and the growing need for flexible mobility alternatives. Daily commuting delays impose substantial economic and social costs on workers, students, and institutions, making travel time a continuing public concern. Earlier estimates from the Japan International Cooperation Agency indicated that transport-related losses in Metro Manila had already reached billions of pesos per day and could continue to rise if no major corrective interventions are implemented (Peña, 2022). More recent traffic assessments have similarly placed Metro Manila among the most congested urban areas globally, reinforcing the difficulty of relying solely on conventional public transportation systems such as jeepneys, buses, and rail transit networks.

In response to these mobility constraints, motorcycle taxi services such as Angkas, JoyRide, and Move It have become increasingly popular among commuters. These services offer speed, accessibility, and flexibility, particularly for passengers navigating dense urban traffic. For students and workers who need to reach destinations on time, motorcycle taxis provide a practical alternative to slower and often overcrowded transport modes. However, the convenience of motorcycle taxi services also introduces public health concerns, especially in relation to the repeated use of shared passenger helmets. Unlike privately owned helmets, motorcycle taxi helmets are used by multiple passengers in succession and are often exposed to sweat, hair residue, skin particles, environmental dust, and other biological materials.

Shared helmets may function as fomites when their inner linings, chin straps, visors, and other contact surfaces are not regularly sanitized. Prior microbiological studies have shown that helmets can harbor bacteria and fungi,

including organisms associated with skin, scalp, and respiratory infections (Sapkota et al., 2020; Shahina et al., 2022; Tayeb et al., 2022). In warm and humid environments, such as Metro Manila, the interior surfaces of helmets may become favorable sites for microbial growth, particularly when cleaning practices are irregular or dependent on individual riders rather than standardized operator protocols. Public complaints regarding foul-smelling helmets, lice concerns, and poor sanitation have also brought attention to the hygiene risks associated with motorcycle taxi use (Abarca, 2024; Bordey, 2024).

The issue is especially relevant for health-allied students, whose academic background includes exposure to microbiology, infection control, and public health concepts. Students in Medical Technology and Nursing programs may be expected to possess relatively high awareness of bacterial contamination and disease transmission. However, awareness does not necessarily translate into consistent protective behavior. Commuters may understand that shared helmets pose contamination risks but may still fail to sanitize helmets, use protective coverings, wash hands, or report unclean equipment because of time constraints, inconvenience, limited access to hygiene materials, or the absence of enforceable sanitation standards. This awareness-practice gap is central to understanding the behavioral and structural dimensions of shared helmet hygiene.

Existing studies on motorcycle taxis have often focused on mobility, transport safety, customer satisfaction, and service quality. Other studies have examined microbial contamination in helmets through laboratory-based analysis. However, fewer studies have examined how passengers perceive contamination risks and how such awareness relates to their actual hygiene practices when using motorcycle taxi helmets. This gap is important because preventive behavior in shared transportation settings depends not only on the presence of pathogens but also on commuters' knowledge, habits, available resources, and the sanitation systems implemented by operators and regulators.

This study addressed this gap by examining the awareness of bacterial contamination and hygiene practices among third-year health-allied students of Centro Escolar University-Manila who use motorcycle taxi services. By focusing on Medical Technology and Nursing students, the study provides insight into whether individuals with health-related academic preparation demonstrate stronger contamination awareness and whether such awareness is associated with more consistent hygiene practices. The findings may contribute to health education, commuter safety, operator sanitation policies, and transport-related public health regulation.

This study aimed to examine the awareness of bacterial contamination and hygiene practices among motorcycle taxi users in a health-allied student population. Specifically, it sought to: (1) describe the demographic profile of the respondents in terms of academic program, sex, frequency of motorcycle taxi use, and personal helmet ownership; (2) determine the respondents' level of awareness of bacterial contamination, hygiene practices, and challenges experienced when using motorcycle taxi helmets; (3) determine whether a significant relationship exists between awareness of bacterial contamination and hygiene practices in motorcycle taxi helmet use; and (4) examine whether awareness and hygiene practices differ according to sex and academic program.

2. Review of Related Literature

2.1 Motorcycle Taxis, Urban Mobility, and Shared Helmet Use

Traffic congestion has become a persistent urban mobility problem in Metro Manila, shaping commuter behavior and increasing reliance on faster transport alternatives. Nnadir et al. (2021) linked worsening traffic conditions to population growth, economic activity, and vehicle ownership, while Hilotin (2024) attributed Manila's congestion to overpopulation, weak transport systems, and uneven urban development. In the Philippine context, Dela Peña (2022) reported the economic losses associated with congestion, while IBON Foundation (2022) argued that transport policy has remained overly oriented toward private vehicles rather than sustainable mass transit. These conditions have made motorcycle taxis a practical alternative for commuters seeking faster and more flexible mobility.

The rise of motorcycle taxi services has also been documented in policy and market discussions. BusinessWorld Online (2024) described motorcycle taxis as increasingly preferred by commuters because they address gaps in conventional public transport, while Dela Cruz (2020) noted the rapid expansion of registered motorcycle taxi riders under the pilot program. Dela Cruz (2025) further reported that the Department of Transportation supported the continued operation of motorcycle taxis as demand for efficient commuting increased. However, Sidel (2020) observed that the sector's legitimacy remains shaped by incomplete regulatory integration. Thus, while motorcycle taxis address mobility needs, their growth has also created concerns about passenger safety and sanitation, particularly because shared helmets are repeatedly used by different passengers.

Among student commuters, Manaois et al. (2024) found that motorcycle taxis are used because of convenience, safety, and perceived cleanliness, with female undergraduate students representing a substantial user group. This suggests that motorcycle taxis are not merely informal transport options but are increasingly embedded in student mobility routines.

2.2 Hygiene Awareness and Commuter Behavior

Commuter awareness of motorcycle taxi services has generally been examined through service quality, convenience, affordability, usability, and safety. In Vietnam, Hoang-Tung et al. (2022) showed that local context affects ride-hailing adoption in motorcycle-based societies, while Loan and Hung (2020) found that service quality, convenience, and usability influence satisfaction and reuse intention. In Indonesia, Aritenang (2024) emphasized the importance of motorcycle-based ride-hailing among commuters in Jakarta and Bandung, particularly for younger and lower-income groups. Efranto and Hidayah (2025) likewise found that affordability, professionalism, and safety influence user choice in motorcycle ride-hailing services.

In the Philippines, Manaois et al. (2024) found that students view motorcycle taxis as practical alternatives because of affordability, convenience, and accessibility. Latonero et al. (2024) similarly emphasized service quality and safety features in evaluating the viability of motorcycle taxis in Metro Manila. German and Cabacungan (2021) linked ease of use to customer satisfaction in motorcycle taxi applications, while Santos et al. (2024) showed that pricing ethics and driver behavior influence commuter trust.

However, much of this literature addresses commuter perception from the standpoint of transport service quality rather than health-risk behavior. This distinction is important because a commuter may be aware of the convenience and safety features of motorcycle taxis without having sufficient awareness of shared helmet sanitation. For health-allied students, awareness may be shaped further by exposure to microbiology, disease transmission, and infection control concepts. The World Health Organization (2020) emphasized the importance of infection prevention and control, which may help explain why Medical Technology and Nursing students are expected to have stronger awareness of microbial risk in shared equipment.

Related Philippine public-health evidence also suggests that awareness and preventive practice are connected but not interchangeable. In a KAP study on leptospirosis prevention in flood-prone communities, awareness showed only weak associations with practice, while enabling conditions and community supports remained necessary for sustained preventive behavior (Temporada et al., 2025).

This point is also relevant to health professions education, where technical knowledge must be translated into situated practice through curriculum-practice alignment, institutional support, and leadership attention to learner readiness (Bermido et al., 2025).

2.3 Microbial and Parasitic Risks in Shared Helmets

Shared motorcycle helmets present potential public health risks because they come into direct contact with the scalp, hair, skin, chin, and facial areas of multiple users. Microbiological evidence indicates that motorcycle helmets may harbor bacteria and fungi when they are not properly cleaned. Shahina et al. (2022) reported bacterial and fungal isolates in motorcycle helmets, including *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas* species, which are commonly associated with skin and respiratory infections. Sapkota et al. (2020) similarly found bacterial and fungal colonies in motorcycle helmets in Nepal, including *Staphylococcus aureus*, *S. epidermidis*, *E. coli*, *Aspergillus niger*, and *A. fumigatus*. Their finding that some bacterial isolates were multidrug-resistant further heightens the public health relevance of shared helmet use.

Fungal contamination has also been documented in motorcycle taxi helmets. Tayeb et al. (2022) found that 80% of examined online motorcycle taxi helmets in Gorontalo City were contaminated with fungi, including *Aspergillus niger*, *A. fumigatus*, *A. oryzae*, and *Rhizopus* species. Although dermatophytes were not detected in that study, the presence of opportunistic fungi still indicates poor helmet hygiene.

Beyond microbial contamination, parasitic contamination is also relevant. The European Centre for Disease Prevention and Control (2022) noted that ectoparasites such as lice may survive under suitable conditions, creating the possibility of indirect transmission through shared items. In warm and humid settings, repeated helmet use may allow sweat, hair particles, and skin debris to accumulate, increasing the likelihood of bacterial, fungal, and parasitic exposure. These findings support the need to examine not only the objective contamination of helmets but also the user awareness and protective practices associated with shared helmet use. Related environmental-health work in

Manila Bay has likewise combined contamination assessment with automated Gram-negative bacterial identification, illustrating how objective microbial profiling can complement exposure-based risk assessment (Ylagan et al., 2026).

2.4 Public Health, Regulation, and Sanitation Challenges

The sanitation of shared helmets is not only an individual hygiene concern but also a regulatory and public health issue. Studies on helmet hygiene and shared mobility suggest that contamination risk is worsened by weak sanitation systems, limited user compliance, and insufficient enforcement. Owino et al. (2024) noted that shared helmet use in motorcycle taxi sectors presents safety and hygiene concerns, particularly in low- and middle-income contexts. During the COVID-19 pandemic, Ballano (2022) criticized the Motorcycle Pillion Shield Regulation in the Philippines because of concerns over scientific basis, consultation, and possible unintended safety and infection risks.

Socioeconomic barriers also affect hygiene compliance. Mwakalila (2025) reported that motorcycle taxi drivers in Dar es Salaam faced health and financial vulnerability because of frequent passenger interaction and reduced income during the pandemic. Setyowati et al. (2025) likewise found that economic constraints, including the cost of personal protective equipment, limited adherence to health protocols among online motorcycle taxi riders in Samarinda, Indonesia. These studies suggest that hygiene behavior is influenced not only by awareness but also by affordability, accessibility, and work conditions. Comparable implementation challenges have been documented in Philippine healthcare accreditation, where resource constraints and process burdens limited compliance despite generally favorable perceptions, underscoring that standards require institutional capacity to become routine practice (Garcia & Atento, 2026).

Technological and procedural sanitation interventions have been proposed. Frizziero et al. (2024) examined sanitation systems for shared mobility, while Natarajan et al. (2022) proposed hygienic padding for motorcycle taxi helmets. Labib and Rusimamto (2023) also presented an automatic helmet dryer system intended to reduce moisture and limit fungal or bacterial growth. In the Philippine setting, public complaints about foul-smelling and lice-bearing helmets have led to Senate attention and company-level sanitation responses (Bordey, 2024; Tulad, 2024). These developments indicate that helmet sanitation has moved from being a private hygiene concern to a matter of operator accountability and public regulation. In another regulated service setting, localized quality-management performance depended on organizational practices and human factors, suggesting that sanitation standards for shared protective equipment likewise require operational routines, monitoring, and accountability rather than policy statements alone (Gamasan & Atento, 2026).

At the institutional level, sanitation governance may also be framed as an analytics-enabled quality concern, since integrated data systems and decision routines can help align health protection, operational accountability, and service reliability in regulated health-related environments (Atento, Quinto, Espelita, & Castaneda, 2025).

2.5 Synthesis and Literature Gap

The reviewed literature shows that motorcycle taxis emerged as a practical response to congestion and weak public transport systems, especially in urban settings where speed, convenience, and accessibility are highly valued (Aritenang, 2024; Dela Peña, 2022; Manaois et al., 2024; Nnadiri et al., 2021). Existing studies also show that commuters evaluate motorcycle taxi services based on affordability, usability, safety, driver behavior, and service quality (Efranto & Hidayah, 2025; German & Cabacungan, 2021; Hoang-Tung et al., 2022; Santos et al., 2024). Meanwhile, microbiological studies demonstrate that motorcycle helmets can harbor bacterial and fungal contaminants, including potentially pathogenic and drug-resistant organisms (Sapkota et al., 2020; Shahina et al., 2022; Tayeb et al., 2022).

However, the literature remains limited in three respects. First, most transport-related studies emphasize mobility and service quality rather than hygiene behavior. Second, microbiological studies establish contamination risk but do not sufficiently examine passenger awareness and actual preventive practices. Third, the Philippine literature on motorcycle taxi helmet hygiene remains limited, particularly among student commuters with health-related academic backgrounds. The present study responds to this gap by examining awareness of bacterial contamination, hygiene practices, and their relationship among Medical Technology and Nursing students who use motorcycle taxi services. This focus allows the study to connect transport behavior, infection-risk awareness, and public health practice within a localized commuter population.

3. Methodology

3.1 Research Design

This study used a quantitative descriptive-correlational research design. The descriptive component was used to determine the respondents' demographic profile, level of awareness of bacterial contamination, hygiene practices, and perceived challenges in maintaining hygiene when using motorcycle taxi helmets. The correlational component was used to examine whether awareness of bacterial contamination was significantly associated with hygiene practices among motorcycle taxi users in a health-allied student population. The design was appropriate because the study measured existing awareness and self-reported hygiene behaviors without manipulating any variable.

3.2 Respondents and Study Setting

The respondents were third-year health-allied students enrolled at Centro Escolar University-Manila during Academic Year 2025-2026. The study included students from two academic programs: Bachelor of Science in Medical Technology and Bachelor of Science in Nursing. These programs were selected because their students have academic exposure to microbiology, infection control, and health-related concepts relevant to bacterial contamination and hygiene behavior.

The total population consisted of 1,041 third-year students, composed of 624 Medical Technology students and 417 Nursing students. From this population, a final sample of 145 respondents was used, consisting of 87 Medical Technology students and 58 Nursing students. The inclusion criteria required respondents to be third-year students, at least 18 years old, enrolled in either Medical Technology or Nursing, users of motorcycle taxi services at least twice per week within the previous four weeks, and willing to provide informed consent. Students outside the specified programs or year level, those who did not meet the minimum motorcycle taxi-use frequency, and those on leave of absence during data collection were excluded.

3.3 Sampling Technique

The study employed proportionate stratified random sampling, using academic program as the stratum. The proportional allocation yielded 87 respondents from the School of Medical Technology and 58 respondents from the School of Nursing. Within each stratum, students were randomly selected from third-year class rosters using a digital randomization tool. The selected students were then sent a pre-screening form to verify eligibility before they proceeded to the main research questionnaire. This procedure was intended to preserve proportional representation between the two programs and reduce selection bias.

3.4 Research Instrument

Data were collected using a structured, self-administered online questionnaire administered through Google Forms. The instrument contained sections on demographic profile, awareness of bacterial contamination, hygiene practices, and challenges in maintaining helmet hygiene. The demographic section gathered information on academic program, sex, motorcycle taxi-use frequency, and personal helmet ownership.

The awareness section used a 4-point Likert scale ranging from 1, Strongly Disagree, to 4, Strongly Agree. It measured respondents' awareness of contamination risks associated with shared motorcycle taxi helmets, including the possibility that helmets may harbor bacteria from multiple users, the role of sweat and hair residue in microbial growth, high-risk contact points such as the inner lining and chin strap, and the risk of skin or scalp infection. The hygiene-practices section used a 5-point frequency scale ranging from 1, Never, to 5, Always. It measured behaviors such as checking helmet cleanliness, using a personal hair covering, sanitizing the helmet, handwashing, avoiding face or hair contact after use, and reporting unclean helmets.

The challenges section used a ranking format to assess perceived barriers to proper hygiene practice, including lack of awareness, limited access to cleaning materials, poor or irregular helmet sanitation, lack of hygiene regulation or enforcement, and inconvenience in bringing or using protective covers. The awareness scale obtained a Cronbach's alpha of .770, while the hygiene-practices scale obtained a Cronbach's alpha of .833, indicating acceptable internal consistency for both scales.

3.5 Data Gathering Procedure

After securing institutional and ethics approval, the researchers coordinated with the appropriate academic units and class representatives for the distribution of the survey link. A pre-screening form was first used to determine whether potential participants met the inclusion criteria. Qualified respondents were then directed to the main Google Forms questionnaire, which began with an informed consent statement explaining the purpose of the study, voluntary participation, anonymity, confidentiality, and the right to withdraw before submission.

The survey was conducted online during the second semester of Academic Year 2025-2026. Responses were monitored by stratum to ensure that the target sample allocation for each program was met. After data collection, responses were exported from Google Forms into Microsoft Excel and Jamovi for cleaning, coding, and statistical analysis. Duplicate, incomplete, or ineligible responses were excluded from analysis.

3.6 Data Analysis

Descriptive statistics were used to summarize the respondents' profile, awareness of bacterial contamination, hygiene practices, and perceived hygiene challenges. Frequencies and percentages were used for categorical variables, while means and standard deviations were used for awareness and hygiene-practice scores.

For inferential analysis, Spearman's rank-order correlation coefficient was used to test the relationship between awareness of bacterial contamination and hygiene practices, with Pearson's r reported as a reference value. Spearman's correlation was appropriate because the awareness-domain distribution violated normality assumptions. Independent-samples t -tests were used for supplementary analyses comparing awareness and hygiene-practice scores by sex and academic program. Statistical significance was evaluated at the .05 level.

3.7 Ethical Considerations

The study complied with the ethical requirements of the Centro Escolar University Institutional Ethics Review Board. Participation was voluntary, anonymous, and limited to respondents who gave informed consent. No invasive procedures, biological sample collection, laboratory testing, or clinical intervention were conducted. The study relied only on self-reported survey data. Data were collected through an online form and stored in password-protected files accessible only to the research team. Respondents were informed that their answers would be used only for academic purposes and reported in aggregate form.

4. Results and Discussion

4.1 Profile of Respondents

The study involved 145 third-year health-allied students from Centro Escolar University-Manila. The sample consisted of 87 BS Medical Technology students, or 60.0%, and 58 BS Nursing students, or 40.0%, reflecting the proportionate allocation used in the sampling procedure. Most respondents were female, with 94 participants, or 64.8%, while male respondents accounted for 51 participants, or 35.2%. In terms of motorcycle taxi use, most respondents used motorcycle taxi services two to three times per week, while a smaller proportion used them four to five times per week or daily. Most respondents did not own a personal motorcycle helmet, indicating strong reliance on company-provided shared helmets. The original results reported 119 respondents, or 82.1%, without personal helmets and only 26 respondents, or 17.9%, with their own helmets.

Table 1. Profile of Respondents

Profile Variable	Category	Frequency	Percentage
Academic Program	BS Medical Technology	87	60.0
	BS Nursing	58	40.0
Sex	Female	94	64.8
	Male	51	35.2
Frequency of Motorcycle Taxi Use	2-3 times per week	100	69.0
	4-5 times per week	40	27.6
	Daily	5	3.4
Personal Helmet Ownership	Yes	26	17.9

Profile Variable	Category	Frequency	Percentage
	No	119	82.1

The respondent profile supports the relevance of the study because the majority depended on shared passenger helmets. This increases the practical significance of investigating awareness and hygiene behavior, since shared helmet use is not incidental but central to the commuting experience of the sample.

4.2 Awareness of Bacterial Contamination and Hygiene Practices

Respondents demonstrated a very high level of awareness of bacterial contamination in shared motorcycle taxi helmets. The overall awareness mean was 3.45, with a standard deviation of 0.39, interpreted as Very High Awareness. The awareness scale also showed acceptable internal consistency, with Cronbach's $\alpha = .770$. The highest-rated awareness item was the belief that frequent helmet use without disinfection increases infection risk, while the lowest-rated items concerned knowledge of proper helmet disinfection methods and awareness of company sanitation protocols.

Respondents also reported a high level of hygiene practice, with an overall mean of 3.60 and a standard deviation of 0.68. The hygiene-practices scale showed good reliability, with Cronbach's $\alpha = .833$. The highest-rated practice was the use of personal hair coverings before wearing shared helmets. Other high-rated behaviors included encouraging other commuters to practice helmet hygiene, checking helmet cleanliness, avoiding touching the face or hair after using a shared helmet, and cleaning or sanitizing the face after helmet use. However, direct sanitization practices, such as disinfecting the helmet with alcohol or wipes, washing hands before and after helmet use, and sanitizing the hair after helmet use, were only moderate.

Table 2. Awareness and Hygiene Practice Scores

Construct / Indicator	Mean	SD	Interpretation
Awareness of bacterial contamination, overall	3.45	0.39	Very High
Highest awareness item: frequent helmet use without disinfection increases infection risk	3.70	0.52	Very High
Lowest awareness item: knowledge of proper disinfection methods	3.14	0.90	High
Lowest awareness item: awareness of company sanitation protocols	3.15	0.87	High
Hygiene practices, overall	3.60	0.68	High
Highest hygiene item: use of personal hair covering	4.11	1.05	High
Moderate hygiene item: sanitizing helmet with alcohol or wipes	3.30	1.08	Moderate
Moderate hygiene item: washing hands before and after helmet use	3.31	1.01	Moderate
Moderate hygiene item: sanitizing hair after helmet use	3.38	1.20	Moderate

These findings suggest that health-allied students understand the risks of bacterial contamination but do not uniformly translate this awareness into active hygiene behavior. The contrast between very high awareness and moderate direct sanitization practices is analytically important. It indicates that knowledge exists, but behavioral execution may be constrained by convenience, availability of materials, commuting speed, and reliance on operators for sanitation.

4.3 Challenges in Maintaining Helmet Hygiene Practices

The respondents identified structural and institutional barriers as the most serious challenges in maintaining helmet hygiene. The greatest challenge was the lack of hygiene regulations or enforcement from companies or government agencies, with a mean of 3.83. Poor or irregular cleaning and sanitation of helmets followed closely, with a mean of 3.75. The inconvenience or negligence associated with bringing or using personal protective covers was also rated as a great challenge. Limited access to cleaning materials and lack of awareness were rated as moderate challenges.

Table 3. Challenges in Maintaining Helmet Hygiene Practices

Challenge	Mean	SD	Interpretation
Lack of hygiene regulations or enforcement from companies/government	3.83	1.25	Great Challenge

Challenge	Mean	SD	Interpretation
Poor or irregular cleaning and sanitation of helmets	3.75	1.27	Great Challenge
Negligence or inconvenience in bringing or using personal protective covers	3.63	1.50	Great Challenge
High cost or limited access to cleaning materials and protective covers	3.48	1.25	Moderate Challenge
Lack of awareness and knowledge about helmet hygiene	3.28	1.26	Moderate Challenge

The ranking of challenges clarifies that the problem is not primarily a knowledge deficit. The least severe challenge was lack of awareness, while the most severe challenges involved enforcement, operator sanitation, and the practical burden of personal protective behavior. This pattern supports a public health interpretation: individual awareness must be supported by infrastructure, regulation, and operator accountability.

4.4 Relationship Between Awareness and Hygiene Practices

Spearman's rank-order correlation was used to determine the relationship between awareness of bacterial contamination and hygiene practices. A significant moderate positive relationship was found between the two variables, $p = .357$, $p < .001$. Pearson's r was reported as a reference value at .386. The null hypothesis of no significant relationship was therefore rejected.

Table 4. Relationship Between Awareness of Bacterial Contamination and Hygiene Practices

Variables	Spearman ρ	Pearson r , Reference	p-value	Decision	Interpretation
Awareness and hygiene practices	.357	.386	< .001	Reject H_0	Moderate positive relationship

The positive relationship indicates that respondents with higher awareness of bacterial contamination risks tended to report more frequent hygiene practices. However, the moderate strength of the relationship shows that awareness is only one factor influencing behavior. This finding is consistent with the earlier challenge results, which suggest that hygiene practices are also shaped by access to cleaning materials, commuting conditions, company sanitation practices, and regulatory enforcement.

4.5 Supplementary Analysis by Sex and Academic Program

Supplementary tests showed that female respondents reported significantly higher awareness than male respondents. Female respondents had a mean awareness score of 3.53, compared with 3.32 for male respondents, with $t = 3.091$ and $p = .002$. However, the difference in hygiene-practice scores by sex was not statistically significant, although female respondents reported a slightly higher mean.

No significant differences were found between BS Medical Technology and BS Nursing students in either awareness or hygiene practices. This suggests that both groups had broadly comparable awareness and behavioral patterns, possibly because both programs share health-science curricular exposure relevant to microbiology, infection control, and public health.

Table 5. Supplementary Group Differences in Awareness and Hygiene Practices

Grouping Variable	Outcome	Group 1 Mean (SD)	Group 2 Mean (SD)	t	p-value	Interpretation
Sex	Awareness	Female: 3.53 (0.38)	Male: 3.32 (0.36)	3.091	.002	Significant
Sex	Hygiene practices	Female: 3.68 (0.70)	Male: 3.45 (0.63)	1.922	.057	Not significant
Academic Program	Awareness	MedTech: 3.47 (0.38)	Nursing: 3.44 (0.39)	0.420	.675	Not significant
Academic Program	Hygiene practices	MedTech: 3.67 (0.70)	Nursing: 3.49 (0.64)	1.587	.115	Not significant

The sex-based awareness difference may reflect differences in risk perception, hygiene vigilance, or safety priorities among female motorcycle taxi users, as suggested by prior literature on student motorcycle taxi use and commuter preferences (Manaois et al., 2024). However, because hygiene practices did not significantly differ by sex, higher awareness among female respondents did not necessarily result in statistically distinct protective behavior. The absence of significant differences between Medical Technology and Nursing students indicates that program-specific differences were less important than their shared status as health-allied students.

Related work on dormitory medical students indicates that health-related behaviors and distress profiles may differ across gendered and lifestyle contexts, supporting the value of targeted student wellness interventions rather than uniform health messaging (Quinto et al., 2025).

4.6 Discussion

The findings show that health-allied students possess strong awareness of bacterial contamination risks associated with shared motorcycle taxi helmets. This is consistent with the expectation that Medical Technology and Nursing students would be more sensitive to microbial transmission risks because of their academic exposure to microbiology, public health, and infection control. The high awareness scores also align with studies showing that helmets may harbor bacteria and fungi, including *Staphylococcus aureus*, *Escherichia coli*, *Aspergillus* species, and other microbial contaminants when shared helmets are not properly sanitized (Sapkota et al., 2020; Shahina et al., 2022; Tayeb et al., 2022).

Despite this strong awareness, hygiene behavior was not uniformly high across all practices. The respondents more frequently adopted low-cost and convenient protective behaviors, such as using hair coverings and checking helmet cleanliness, but less consistently performed more active behaviors such as sanitizing helmets, washing hands, or sanitizing hair after helmet use. This suggests that hygiene practice is not merely an outcome of knowledge. It also depends on situational feasibility. A commuter may know that shared helmets carry contamination risks but may not have alcohol wipes, sufficient time, or an appropriate setting to disinfect the helmet before a ride.

The challenge findings strengthen this interpretation. Respondents identified the lack of hygiene regulations or enforcement and poor or irregular helmet cleaning as greater barriers than lack of awareness. This means that the problem must be understood structurally, not only individually. The burden of helmet hygiene cannot rest solely on passengers, especially when shared helmets are part of the service infrastructure. Motorcycle taxi operators and regulators have a direct role in setting minimum sanitation standards, ensuring visible cleaning practices, and giving passengers access to protective options.

The significant positive correlation between awareness and hygiene practices confirms that awareness matters. Students who were more aware of contamination risks tended to report better hygiene behavior. However, the relationship was moderate, not strong. This is the central finding of the study. Awareness improves the likelihood of protective practice, but it does not guarantee consistent action. This supports the broader public health view that behavior change requires enabling conditions, including access, reminders, sanitation supplies, enforcement mechanisms, and institutional support. A comparable awareness-behavior asymmetry has been observed in another Philippine student domain, where awareness predicted some longer-horizon financial behaviors but not spending, illustrating that knowledge does not translate uniformly across actions (Espelita et al., 2025).

The supplementary findings also provide useful nuance. Female respondents had significantly higher awareness than male respondents, but their hygiene practices were not significantly different. This may indicate that awareness is easier to influence than practice. Meanwhile, the lack of significant difference between Medical Technology and Nursing respondents suggests that both groups had comparable health-related awareness and hygiene behavior. For this sample, being part of a health-allied student population appears more relevant than the specific academic program.

Overall, the study contributes to commuter-health research by connecting three elements often studied separately: motorcycle taxi use, shared helmet contamination risk, and passenger hygiene behavior. The findings support the need for a shift from awareness-only interventions to systems-based sanitation measures. In practical terms, public health campaigns should be paired with operator protocols and regulatory requirements. Without such structural support, even well-informed passengers may remain unable to practice consistent helmet hygiene.

5. Conclusions, Recommendations, and Implications

5.1 Conclusions

This study examined the awareness of bacterial contamination and hygiene practices among motorcycle taxi users in a health-allied student population. Based on the findings, the respondents were mostly female, enrolled in BS Medical Technology, used motorcycle taxi services two to three times per week, and did not own personal motorcycle helmets. Their heavy reliance on company-provided shared helmets reinforces the relevance of helmet sanitation as a commuter health concern.

The respondents demonstrated a very high level of awareness of bacterial contamination in shared motorcycle taxi helmets. They recognized that helmets may harbor bacteria from multiple users, that shared use may increase skin or scalp infection risks, and that repeated helmet use without disinfection may elevate contamination risk. However, the lower scores on knowledge of proper disinfection methods and company sanitation protocols indicate that conceptual awareness was stronger than procedural or institutional knowledge.

The respondents reported a high overall level of hygiene practice, but active sanitization behaviors were not consistently performed. Practices such as using personal hair coverings and checking helmet cleanliness were more common, while sanitizing helmets, washing hands before and after helmet use, and sanitizing hair after use were only moderate. This shows a practical awareness-behavior gap, where students know the risk but do not always perform the more effortful or resource-dependent hygiene behaviors.

The most serious challenges were structural and institutional. Respondents identified the lack of hygiene regulation or enforcement and poor or irregular helmet sanitation by operators as the leading barriers. Lack of awareness was not the primary problem, suggesting that the issue cannot be addressed through health education alone.

A significant moderate positive relationship was found between awareness and hygiene practices. Students with higher awareness tended to report better hygiene behaviors, but the moderate strength of the relationship indicates that awareness alone is not sufficient to ensure consistent protective action. Structural, economic, and regulatory factors also shape hygiene behavior. Female respondents showed significantly higher awareness than male respondents, but hygiene practices did not significantly differ by sex. No significant differences were found between BS Medical Technology and BS Nursing students, indicating broadly comparable awareness and hygiene behavior across the two health-allied programs.

5.2 Recommendations

Motorcycle taxi passengers should be encouraged to convert awareness into routine protective behavior. Since active sanitization practices were only moderate, passengers should carry travel-sized alcohol sprays, sanitizing wipes, or disposable hair coverings when using motorcycle taxi services. They should also report visibly dirty, foul-smelling, or poorly maintained helmets to drivers or operators to reinforce accountability. Low-burden behavioral self-monitoring has also been tested among Philippine students through digital sleep diaries, providing a useful model for reminder- or tracking-based health routines even though the short-term intervention effect was not statistically conclusive (San Juan et al., 2026).

Motorcycle taxi operators should adopt standardized helmet sanitation procedures. These may include regular disinfection schedules, use of effective helmet-safe disinfectants, provision of disposable liners or protective caps, and visible sanitation indicators such as cleaning timestamps or helmet sanitation tags. These measures directly respond to the respondents' concern that poor or irregular cleaning remains one of the greatest barriers to safe shared helmet use.

Public health authorities should develop evidence-based sanitation guidelines for shared motorcycle taxi helmets. The Department of Health and local government units may issue minimum hygiene protocols covering helmet cleaning frequency, acceptable disinfecting materials, storage procedures, and passenger-facing health advisories. These should be communicated not only to health-allied students but also to the general commuting public, whose contamination awareness may be lower.

Transportation regulatory agencies such as the LTFRB, DOTr, and MMDA should integrate helmet sanitation into motorcycle taxi accreditation and monitoring requirements. Compliance checks should not be limited to road safety and driver qualification, but should also include shared protective-equipment hygiene. The absence of formal helmet sanitation standards represents a policy gap that requires regulatory correction.

Academic institutions may use the findings to strengthen applied infection-control education. Health science programs can include commuter hygiene scenarios in microbiology, public health, or infection prevention discussions. This would help students translate technical knowledge into daily protective routines. University-wide awareness initiatives may also be extended to non-health-allied students who use motorcycle taxi services.

Such initiatives may also contribute to broader workforce readiness, since health workforce development depends not only on technical preparation but also on competency alignment, applied preparedness, and the capacity to respond to public health risks in everyday settings (Atento, Quinto, & Espelita, 2025).

Future researchers should expand the study to non-health-allied students, general commuters, and other urban transport users. Laboratory-based microbial swab testing of actual motorcycle taxi helmets should also be conducted to validate perceived contamination risks. Longitudinal and mixed-methods studies may further examine how awareness campaigns, sanitation policies, or operator-level interventions affect hygiene behavior over time. Philippine laboratory research combining contamination assessment with bacterial identification and antimicrobial-susceptibility profiling further illustrates the value of coupling exposure surveys with objective microbiological measurements (Nacino & Basit, 2025).

5.3 Implications of the Study

The study has practical implications for commuter hygiene. It shows that passengers may possess high awareness of contamination risks but still fail to perform consistent protective behaviors when sanitation materials, time, or operator support are limited. Hygiene interventions should therefore be designed for convenience and routine use.

The study has policy implications for motorcycle taxi regulation. Shared helmets are part of the transport service, not merely private passenger equipment. This means sanitation should be treated as an operational and regulatory responsibility. Minimum hygiene standards can strengthen passenger safety, improve public trust, and reduce avoidable exposure to shared-equipment contamination.

The study has educational implications for health-allied programs. Technical awareness of microbial contamination should be connected with everyday infection-control behavior. For Medical Technology and Nursing students, commuter hygiene provides a practical context for applying classroom knowledge to real-world public health risks.

The study also has methodological implications for future research. Since the present study relied on self-reported awareness and hygiene practices, future studies should combine behavioral surveys with microbiological testing, observation, or interviews. This would produce stronger evidence on the relationship between perceived risk, actual contamination, and protective behavior.

Future research may also examine passenger narratives, complaints, and sanitation reports as qualitative or text-based evidence, provided that such narrative data are handled with privacy, consent, cultural sensitivity, and safeguards against decontextualized analytics (Atento, Quinto, Espelita, & San Juan, 2025).

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