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Knowledge, Attitude and Practice Regarding Transmission and Prevention of Avian Flu Among Undergraduate Students at International Islamic University Malaysia (IIUM) Kuantan Campus

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ABSTRACT

Background: Avian influenza, or avian flu, is a zoonotic disease caused by Influenza A (H5N1), transmitted from infected birds or poultry to humans through inhalation of contaminated air or direct contact. . Although avian flu has been a global public health concern for decades, limited studies have explored the awareness and preventive behaviours among university students in Malaysia. This study aimed to evaluate the knowledge, attitude, and practice levels regarding avian flu transmission and prevention among undergraduate students at the International Islamic University Malaysia (IIUM), Kuantan Campus.

Methods: A quantitative cross-sectional study was conducted using convenience sampling among 413 undergraduate students at IIUM Kuantan Campus from March to May 2024. Data were collected using structured questionnaires adapted from previously validated instruments, distributed in English via Google Forms to students from Year 1 to Year 5 across various Faculties.

Results: Most respondents showed moderate to good knowledge, attitudes, and practices on avian flu transmission and prevention. A significant association was found between respondents' course of study and knowledge levels ($p<0.05$). However, no significant associations were identified between any sociodemographic factors and attitudes towards avian flu. Gender and course of study were significantly associated with preventive practices concerning avian flu transmission ($p<0.05$).

Conclusion: Despite generally good knowledge, attitudes, and practices related to avian flu among respondents, notable gaps in knowledge and preventive behaviors remain. Urgent implementation of targeted educational interventions and awareness campaigns is critical to bridge these gaps, ensuring comprehensive preparedness and effective preventive measures against avian flu among future health professionals.

Keywords: Avian influenza; Avian flu; University students; Knowledge; Attitude; Practice.

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INTRODUCTION

Avian influenza, commonly known as bird flu, is a zoonotic infectious disease caused by the Influenza A virus subtype H5N1, belonging to the Orthomyxoviridae family. The virus encompasses various antigenic subtypes due to different combinations of haemagglutinin (HA) and neuraminidase (NA) proteins (1-3). Among 18 HA subtypes and 11 NA subtypes identified, birds host 16 HA and 9 NA subtypes, with H5 and H7 frequently associated with human infections (4). Influenza type A viruses are categorised into low pathogenic avian influenza (LPAI), typically causing mild or asymptomatic infections in birds, and highly pathogenic avian influenza (HPAI), characterised by severe symptoms and high mortality rates facilitated by efficient airborne transmission (5,6).

Generally, avian flu spreads from infected birds to healthy birds through saliva, nasal secretions, or faeces (7). Transmission to domestic animals and humans primarily occurs via direct contact or consumption of infected birds and poultry products (6,8,9). Although human-to-bird transmission has not been documented by the World Health Organization (WHO), rare instances of human-to-human transmission have been reported (10,11). Nonetheless, there remains a concern that the virus could mutate and potentially facilitate widespread human-to-human transmission (7).

Laboratory diagnosis of avian influenza involves direct detection methods such as reverse transcriptase polymerase chain reaction (RT-PCR), real-time PCR (qPCR), and serological tests, including haemagglutination inhibition assays and enzyme-linked immunosorbent assays (ELISA) (12). Among these, qPCR is preferred due to its specificity for detecting various NA genes and HA subtypes, using subtype-specific primers to reduce false negatives. Additionally, Rapid Influenza Diagnostic Tests (RIDTs) detect influenza A and B nucleoprotein antigens in respiratory samples (13).

The first recorded avian flu outbreak occurred in Italy in 1878 (14). Highly pathogenic avian influenza first emerged in Asia in 1996 and subsequently spread globally to Europe, the Middle East, and Africa (15). The initial human infection was reported in Hong Kong in 1997, resulting in severe respiratory illness in 18 individuals, with six fatalities. Regular monitoring since then has identified cases predominantly in East Asian countries, including Cambodia, China, South Korea, Indonesia, Vietnam, and Thailand (16-18). Avian flu outbreaks typically occur in colder seasons, with Bangladesh, Cambodia, China, Egypt, Indonesia, Thailand, Turkey, and Vietnam experiencing peak outbreaks during colder months (19). Since the initial human case in Hong Kong, approximately 800 cases of human infection have been confirmed worldwide, resulting in 460 fatalities across three countries (20).

Malaysia experienced four waves of avian flu outbreaks in 2004, 2006, 2007, and 2017, with no human fatalities reported (21). The first outbreak occurred in Pasir Pekan, Wakaf Bharu, Kelantan, in 2004, potentially linked to ongoing outbreaks in neighbouring Thailand (13,22). Subsequent outbreaks occurred in Wilayah Persekutuan, Penang, and Perak (2006), and Paya Jaras, Sungai Buloh, Selangor (2007) (23). Malaysia declared itself avian flu-free in 2007 until the outbreak resurfaced in 2017 in Kota Bharu, Kelantan, and later in 2018 in Sabah (21,24). Since September 2018, Malaysia has successfully maintained its avian flu-free status, attributed to effective public health strategies, emergency preparedness plans, awareness campaigns, and interagency collaboration implemented after previous outbreaks (25). Nonetheless, there remains concern that awareness may diminish over time.

Recent cases of avian flu transmission among mammals, particularly domestic animals such as dogs and cats in Poland, indicate the virus's potential adaptation for easier human infection (26). Prior to the COVID-19 pandemic, avian flu was considered a significant pandemic threat due to its potential human transmissibility (27). Although currently exhibiting limited human-to-human transmission capability, its high pathogenicity and wide dissemination among bird populations remain concerning. New variants capable of mammalian transmission have emerged, notably after a COVID-19-related outbreak in mink farms in Spain in 2021 (27).

In Malaysia, poultry meat consumption per capita was estimated at 45 kilograms in 2022,

projected to reach 53.74 kilograms by 2031 (28,29). Consequently, poultry imports from countries like Thailand, Denmark, and Brazil have increased, raising concerns due to recent avian flu outbreaks in these nations (30-32). Despite stringent import regulations by the Malaysian Department of Veterinary Services (DVS), the possibility of undetected infected poultry entering the country persists, posing ongoing risks of avian influenza outbreaks (33-35).

Assessing community preparedness and awareness, particularly among university students enrolled in health sciences and science-based programs, is critical due to their potential frontline exposure in healthcare settings and their role in shaping future public health responses. Although research on avian flu awareness and practices often targets specific occupational groups, there is limited evidence regarding university students in health sciences fields. This gap highlights the need to identify how well-informed and prepared future healthcare professionals are in addressing zoonotic threats such as avian influenza. The problem addressed in this study stems from the lack of local data on students' knowledge, attitudes, and preventive behaviours toward avian flu, despite its ongoing public health relevance. Hence, students at IIUM Kuantan Campus, with its concentration of health-related faculties, represent an important demographic for evaluating preparedness, knowledge, and preventive practices regarding avian flu. Therefore, this study aimed to evaluate the levels of knowledge, attitude, and practice related to avian flu transmission and prevention among undergraduate students at the International Islamic University Malaysia (IIUM), Kuantan Campus.

METHODS

The cross-sectional study was conducted among 413 undergraduate students from a public university in the East Coast region, using a convenient sampling method. The study was carried out between March and May 2024. The inclusion criteria for this study encompassed undergraduate students enrolled at the IIUM Kuantan campus who were willing and able to complete the questionnaire in English. Excluded from the study were postgraduate students and those unable to respond in English. Informed consent was obtained from all participants prior to data collection. The purpose, procedures, potential risks, and benefits of the study were clearly explained on the first page of the online questionnaire. They were also informed that their responses would remain anonymous and confidential, with all data used solely for research purposes. Completion and submission of the questionnaire were considered as provision of informed consent.
The study was ethically approved by the Kulliyyah of Nursing Postgraduate and Research Committee (KNPGRC) and the International Islamic University Malaysia Research Ethics Committee (IREC), with the approval number IREC2024-101.

Data Collection

The instrument used was the Knowledge, Attitude, and Practice (KAP) Questionnaire on Avian Influenza, a structured self-administered questionnaire adapted from previous study (16). It consisted of four sections: (a) sociodemographic information, (b) knowledge about avian influenza, (c) attitudes toward prevention, and (d) preventive practices.

Part A collected sociodemographic characteristics, including gender, year of study, Kulliyyah, and residential area. Part B assessed knowledge on avian flu through 16 items using a 3-point scale ("true", "false", "do not know"). Each correct answer received a score of 2, incorrect answers scored 0, and "do not know" responses scored 1. Part C measured respondents' attitudes toward transmission and prevention of avian flu using 11 items rated on a 5-point Likert scale from "strongly disagree" (1) to "strongly agree" (5). Part D evaluated preventive practices across seven items, rated using a 3-point scale ("all the time", "sometimes", "never") scored as 2, 1, and 0 respectively. Data were collected using Google Forms. The questionnaire was available only in English and demonstrated good internal consistency, with a Cronbach's alpha value of 0.88 obtained from a pilot study involving 30 respondents.

Statistical Analysis

The data gathered from this research were entered and analysed using IBM Statistical Package for the Social Sciences (SPSS) Version 27. Descriptive statistical analyses were

performed to measure frequencies and percentages for sociodemographic variables, including gender, year of study, Kulliyyah (faculty), and urbanisation background.
Pearson's Chi-Square test was employed to examine associations between categorical variables such as gender, Kulliyyah, year of study, urbanisation background, knowledge level, attitude, and preventive practices. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Sociodemographic Data

Table 1 presents the sociodemographic characteristics of respondents in this study. A total of 413 respondents participated, consisting of 120 males (29.1%) and 293 females (70.9%). The majority of the respondents were from the Kulliyyah of Nursing, with 128 respondents (31.0%), followed by 110 respondents from the Kulliyyah of Allied Health Sciences (26.6%), 66 respondents from the Kulliyyah of Science (16.0%), 52 respondents from the Kulliyyah of Medicine (12.6%), 29 respondents from the Kulliyyah of Pharmacy (7.0%), and the remaining 28 respondents from the Kulliyyah of Dentistry (6.8%).

Regarding the year of study, the largest group comprised fourth-year students with 137 respondents (33.2%), followed by second-year students with 104 respondents (25.2%), third-year students with 91 respondents (22.0%), first-year students with 76 respondents (18.4%), and fifth-year students with five respondents (1.2%).

In terms of urbanisation background, most respondents were from urban areas, totalling 300 respondents (72.6%), while 113 respondents (27.4%) came from rural areas.

Level of Knowledge, Attitude and Practice Regarding Avian Flu

Table 2 presents the respondents' levels of knowledge, attitude, and practice regarding the transmission and prevention of avian flu. Approximately half of the respondents (51.6%) demonstrated good knowledge, while 40.7% had moderate knowledge. Only 7.7% displayed poor knowledge regarding avian flu. The majority of respondents (98.1%) showed good attitudes toward transmission and prevention, whereas 1.7% had moderate attitudes, and only 0.2% exhibited poor attitudes. Regarding practices, 53.3% of respondents had good preventive practices, 45.8% had moderate practices, and only 1.0% had poor preventive practices.

Knowledge Regarding Transmission and Prevention of Avian Flu

As illustrated in **Table 3**, most respondents (77.2%) correctly recognised avian flu as a contagious infection, and 66.3% accurately identified its causative agent as the Highly Pathogenic Influenza A (H5N1) virus. However, 53.3% of respondents expressed uncertainty regarding similarities in signs and symptoms between avian influenza and swine influenza.

Regarding transmission modes, a majority understood animal-to-animal (61.3%) and animal-to-human (75.5%) transmission routes. However, respondents were less certain about human-to-human transmission (56.4% affirmative; 31.0% uncertain). High levels of uncertainty were noted for transmission through touching uncooked poultry (41.4%), uncooked eggs (48.7%), and uncooked frozen poultry (49.9%).

Respondents accurately identified poultry (69.0%) and birds (82.3%) as significant transmission vehicles. Nevertheless, 54.2% were uncertain about the involvement of other animals. Most respondents correctly identified poultry workers (77.7%) as a high-risk group, followed by butchers (64.9%), hunters (60.8%), and veterinarians (53.5%), although notable uncertainty persisted regarding hunters (32.2%), butchers (29.3%), and veterinarians (27.1%).

Attitude Regarding Transmission and Prevention of Avian Flu

Table 4 demonstrates the respondents attitudes towards avian flu prevention measures. A strong agreement was noted regarding handwashing with soap before (88.9%) and after eating (89.1%). Similarly, respondents strongly agreed on the necessity of handwashing before (69.2%) and after (90.1%) touching raw poultry meat. Using gloves to handle raw poultry meat was strongly agreed upon by 59.3% of respondents.

Moreover, respondents strongly agreed on the importance of using separate knives (60.3%) and cleaning cutting boards (82.6%) when handling raw poultry. A balanced diet (79.2%), regular exercise (75.3%), and maintaining good personal (92.5%) and environmental hygiene (91.3%) were also strongly supported.

Practice Regarding Transmission and Prevention of Avian Flu

Table 5 indicates respondents practices concerning avian flu prevention. Approximately half of the respondents (49.6%) consistently washed their hands with soap before eating, while a higher proportion (84.0%) consistently washed their hands after eating. Covering the nose and mouth consistently when sneezing (78.9%) and coughing (76.0%) were common practices.

For influenza-like symptoms, 59.6% of respondents sometimes wore surgical masks, whereas 34.9% consistently used masks. Consulting a doctor promptly when experiencing influenza-like symptoms was a less common consistent practice (26.6%), with 61.3% consulting sometimes. Notably, 70.0% of respondents reported never living closely with poultry when experiencing influenza-like symptoms.

Table 1: The Sociodemographic Data of the Respondents (N=413)

Variables		Frequency (*f*)	Percentage (%)
Gender	Male	120	29.1
	Female	293	70.9
Course	Kulliyyah of Medicine	52	12.6
	Kulliyyah of Pharmacy	29	7.0
	Kulliyyah of Nursing	128	31.0
	Kulliyyah of Dentistry	28	6.8
	Kulliyyah of Allied Health Sciences	110	26.6
	Kulliyyah of Science	66	16.0
Year of Study	Year 1	76	18.4
	Year 2	104	25.2
	Year 3	91	22.0
	Year 4	137	33.2
	Year 5	5	1.2
Urbanization	Urban	300	72.6
	Rural	113	27.4

Table 2: The Level of Knowledge, Attitude and Practice Regarding Transmission and Prevention of Avian Flu (N=413)

Variables		Frequency (*f*)	Percentage (%)
Level of Knowledge	Good	213	51.6
	Moderate	168	40.7
	Poor	32	7.7
Level of Attitude	Good	405	98.1
	Moderate	7	1.7
	Poor	1	0.2
Level of Practice	Good	220	53.3
	Moderate	189	45.8
	Poor	4	1.0

Table 3: The Level of Knowledge Regarding Transmission and Prevention of Avian Flu (N=413)

Statement	True, n (%)	False, n (%)	Do not Know, n (%)
Definition			
Avian flu is a contagious infection	319 (77.2)	11 (2.7)	83 (20.1)
It is caused by Highly Pathogenic Influenza A (H5N1) virus	274 (66.3)	2 (5.0)	137 (33.2)
Avian influenza is similar with swine influenza regarding their signs and symptoms	182 (44.1)	11 (2.7)	220 (53.3)
Mode of transmission			
Animal-to-animal	253 (61.3)	29 (7.0)	131 (31.7)
Animal-to-human	312 (75.5)	18 (4.4)	83 (20.1)
Human-to-human	233 (56.4)	52 (12.6)	128 (31.0)
Touching uncooked poultry	181 (43.8)	61 (14.8)	171 (41.4)
Touching uncooked eggs	116 (28.1)	96 (23.2)	201 (48.7)
Touching uncooked frozen poultry	100 (24.2)	107 (25.9)	206 (49.9)
Vehicles of transmission			
Poultry	285 (69.0)	19 (4.6)	109 (26.4)
Birds	340 (82.3)	8 (1.9)	65 (15.7)
Other animals	123 (29.8)	66 (16.0)	224 (54.2)
Risk groups			
Poultry workers	321 (77.7)	7 (1.7)	85 (20.6)
Butchers	268 (64.9)	24 (5.8)	121 (29.3)
Hunters	251 (60.8)	29 (7.0)	133 (32.2)
Veterinarians	221 (53.5)	80 (19.4)	112 (27.1)

Table 4: The Level of Attitude Regarding Transmission and Prevention of Avian Flu (N=413)

Statement	Strongly agree, n (%)	Agree, n (%)	Uncertain, n (%)	Disagree, n (%)	Strongly disagree, n (%)
We should wash our hands with soap:					
Before eating	367 (88.9)	32 (7.7)	6 (1.5)	0 (0.0)	8 (1.9)
After eating	368 (89.1)	33 (8.0)	3 (0.7)	0 (0.0)	9 (2.2)
Before touching raw poultry meat	286 (69.2)	76 (18.4)	34 (8.2)	8 (1.9)	9 (2.2)
After touching raw poultry meat	372 (90.1)	28 (6.8)	3 (0.7)	0 (0.0)	10 (2.4)
Using gloves to touch raw poultry meat is a good hygienic practice	245 (59.3)	74 (17.9)	58 (14.0)	14 (3.4)	22 (5.3)
We need to prepare raw poultry and other foods using different knives as a good practice	249 (60.3)	89 (21.5)	45 (10.9)	13 (3.1)	17 (4.1)
We should clean the cutting boards after preparing raw poultry meat	341 (82.6)	43 (10.4)	8 (1.9)	4 (1.0)	17 (4.1)
We need to build up good body resistance through:					
Balanced diet	327 (79.2)	74 (17.9)	3 (0.7)	1 (0.2)	8 (1.9)
Regular exercise	311 (75.3)	81 (19.6)	10 (2.4)	3 (0.7)	8 (1.9)
We need to maintain:					
Good personal hygiene	382 (92.5)	23 (5.6)	1 (0.2)	0 (0.0)	7 (1.7)
Good environmental hygiene	377 (91.3)	28 (6.8)	1 (0.2)	0 (0.0)	7 (1.7)

Table 5: The Level of Practice Regarding Transmission and Prevention of Avian Flu (N=413)

Statement	All the times, n (%)	Sometimes, n (%)	Never been practice, n (%)
I wash my hands with soap:			
Before eating	205 (49.6)	197 (47.7)	11 (2.7)
After eating	347 (84.0)	66 (16.0)	0 (0.0)
I cover my nose and mouth when I am:			
Sneezing	326 (78.9)	86 (20.8)	1 (0.2)
Coughing	314 (76.0)	97 (23.5)	2 (0.5)
When I have influenza-like symptoms such as cough, runny nose and sore throat:			
I wear surgical mask	144 (34.9)	246 (59.6)	23 (5.6)
I consult the doctor promptly	110 (26.6)	253 (61.3)	50 (12.1)
I live very closely with poultry	47 (11.4)	77 (18.6)	289 (70.0)

Association between Sociodemographic Background and Knowledge, Attitude and Practice Levels Regarding Avian Flu

As presented in **Table 6**, the Pearson's Chi-Square analysis showed a significant association between the course of study and knowledge level regarding avian flu (p=0.024). However, there were no significant associations found between gender (p=0.814), year of study (p=0.731), and urbanization (p=0.142) with knowledge levels. Similarly, there was no significant difference in attitude levels regarding avian flu transmission and prevention based on gender (p=0.210), course (p=0.807), year of study (p=0.827), and urbanization (p=0.608). Conversely, significant associations were observed between gender (p=0.032) and course of study (p<0.001) with practice levels, whereas year of study (p=0.324) and urbanization (p=0.980) were not significantly associated with practice levels regarding the prevention of avian flu transmission.

Table 6: The Association Between Sociodemographic Background With Level Of Knowledge, Attitude And Practice Regarding Transmission And Prevention Of Avian Flu (N=413)

Variables	Level of Knowledge (p-value)	Level of Attitude (p-value)	Level of Practice (p-value)
Gender	0.814	0.210	0.032*
Course	0.024*	0.807	<0.001*
Year of study	0.731	0.827	0.324
Urbanization	0.142	0.608	0.980

*Pearson's Chi Square, p<0.05

DISCUSSION

The findings of this study revealed that the majority of respondents had good (51.6%) to moderate (40.7%) knowledge regarding avian flu transmission and prevention. Most respondents were aware that avian flu is a contagious infection caused by the Highly Pathogenic Influenza A (H5N1) virus. These findings align with previous studies conducted among university students and communities, indicating broad awareness of the contagious nature and the causative agent of avian flu (36, 37). However, a notable proportion of respondents were unaware of the similarity between avian flu and swine flu symptoms, possibly due to lower incidence rates in the study area. This is consistent with prior research indicating limited awareness regarding symptom similarities among university students in Malaysia (16).

Respondents generally demonstrated good knowledge of transmission modes, including animal-to-animal, animal-to-human, and human-to-human pathways. Nevertheless, fewer respondents were certain about transmission through touching uncooked poultry, eggs, and frozen poultry, aligning with previous studies that highlighted similar gaps in awareness (1,16,36). Contrastingly, research involving poultry and bird market workers showed comparatively lower awareness of avian flu transmission modes (38,39). The majority correctly identified poultry and birds as significant transmission vehicles, though fewer recognised other animals' roles, consistent with findings from similar studies (16,36). Respondents also identified occupational risk groups correctly, such as poultry workers, butchers, hunters, and veterinarians, although some uncertainty persisted, similar to earlier research among students and high school populations (36,40,41).

Nearly all respondents (98.1%) displayed positive attitudes towards preventive practices. However, uncertainty remained regarding certain hygienic practices, such as the use of gloves and separate knives for handling poultry. This highlights the need for clearer educational messaging, as similarly noted in studies conducted in Nepal, Bangladesh, Indonesia, and Malaysia (1,16,29,36,37,39,40). Some respondents also demonstrated negative attitudes toward specific hygiene practices such as handwashing after handling poultry and cleaning cutting boards, underscoring the need for enhanced public education.

In terms of preventive practices, approximately half (53.3%) of respondents showed good adherence, with a substantial proportion (45.8%) exhibiting moderate adherence. Regular handwashing before eating was less consistently practised compared to after eating, reflecting mixed adherence reported in previous Malaysian studies (16, 36-41). While most respondents covered their nose and mouth when coughing or sneezing, fewer consistently used surgical masks or sought medical consultation promptly when experiencing influenza-like symptoms, possibly due to symptom severity perceptions or fatigue from extended preventive practices during the COVID-19 pandemic. These results suggest targeted public health interventions to reinforce preventive behaviours. Previous studies have similarly noted low consistent mask usage and consultation practices among students and poultry workers (3,16,36,40).

Analysis revealed a significant association between respondents' course of study and their knowledge and practice levels, notably higher among students from health-related faculties (Nursing, Allied Health Sciences, and Medicine). This finding concurs with previous studies indicating higher knowledge levels among students with clinical exposure (16,41). Gender also influenced preventive practices, with female respondents exhibiting better adherence than males, consistent with past research identifying gender-based differences in practice levels (1,36). However, year of study and urbanisation showed no significant association with knowledge or practice levels, paralleling results from other studies (16,36), although some previous research identified rural residents as having lower preventive practices (38).

CONCLUSION

The study concludes that most respondents possessed good to moderate levels of knowledge, attitudes, and practices regarding avian flu transmission and prevention. Nonetheless, considerable room remains for improvement, particularly among respondents with moderate knowledge and practice levels. Higher knowledge and practice levels observed among students from medical and health-related faculties suggest the positive impact of clinical exposure and specialised education. Therefore, targeted educational interventions, including collaborative mass media campaigns involving various Faculties, focused academic initiatives, and governmental efforts, are crucial to enhancing awareness and safe preventive practices. These measures will better equip students, especially future healthcare and public health professionals, to effectively prevent and manage avian flu outbreaks.

This study has some limitations. It was cross-sectional, meaning the findings show only one point in time and cannot explain cause and effect. The use of self-reported questionnaires may have led to some bias, and the convenience sampling method limits how far

the results can represent all students. Future research should involve more universities, include larger and more diverse samples, and use interviews or longitudinal studies to better understand how education and awareness influence preventive practices.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding this work.

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AUTHOR CONTRIBUTIONS

SHR: Conceptualization, methodology, data collection, interpretation, and original draft writing.
SAH: Conceptualization, methodology and critical review.
WNI: Critical review.
NZA: Conceptualization, methodology and critical review.
NO: Conceptualization, methodology, supervision, data interpretation, manuscript writing, critical review, editing, and overall project supervision.

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