Original Research Article

School Health Program: Early Detection and Environmental Health Assessment of Children and Adolescents in National Guard Iskan, Alhassa.”

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| --- |
| **ABSTRACT:**  **Background:** The health and well-being of school students are critical for future generations. In Saudi Arabia, the School Health Program aims to enhance student health through early detection of health issues and evaluation of school environments. This study assessed the general health of students and the quality of school infrastructure in National Guard Iskan Al-Ahsa.  **Methods:** A cross-sectional study was conducted among 799 students aged 6–18 years from National Guard Iskan Al-Ahsa schools. Data were collected via questionnaires and direct assessments, focusing on chronic illnesses, vision problems, scoliosis, body mass index (BMI), and school environmental quality (buildings, canteens, and food preparation). Descriptive statistics and Chi-square tests were used for analysis via SPSS**.**  **Results:** Key findings included a 13.8% prevalence of chronic illnesses, 16.8% vision problems, and 1.0% scoliosis among students. BMI distribution revealed 47.8% underweight, 36.9% normal weight, 10.3% overweight and 5.0% obese. Age and gender significantly influenced health outcomes, with higher vaccination rates in females (97.0% vs. 84.9%, p=0.049) and increased vision problems with age (p=0.002). School environments were generally rated excellent, though variability existed in ventilation and playground conditions.  **Conclusion:** The study highlights the need for targeted health interventions and continuous environmental monitoring to align with Saudi Arabia’s National School Health Program goals. Addressing underweight prevalence and vision issues, alongside maintaining high standards in school infrastructure, is essential for promoting student well-being. |

**Keywords:** School health, children and adolescents, chronic illness, BMI, vision assessment, scoliosis, environmental quality, Saudi Arabia.

1. **INTRODUCTION**

The health and well-being of school-aged children and adolescents represent a cornerstone of public health initiatives worldwide, as this population forms the foundation for future societal development (1). In Saudi Arabia, the importance of school health has been increasingly recognized, leading to the implementation of the National School Health Program, which aims to enhance students' health through early detection of medical conditions and the provision of a safe and conducive learning environment (2). Despite these efforts, gaps remain in the comprehensive assessment of student health and the quality of school infrastructure, particularly in specific regions such as National Guard Iskan Al-Ahsa. This study seeks to address these gaps by evaluating the general health status of children and adolescents, as well as the environmental conditions of their schools, to inform targeted interventions and policy improvements.

Globally, school health programs have demonstrated significant benefits in identifying and managing chronic illnesses, vision problems, and musculoskeletal disorders such as scoliosis, all of which can profoundly impact academic performance and long-term quality of life (3). For instance, undiagnosed vision problems can lead to poor academic outcomes, while untreated scoliosis may result in severe physical complications later in life. Similarly, the prevalence of underweight, overweight, and obesity among school-aged children is a growing concern, as these conditions are linked to both immediate health risks and long-term metabolic disorders (4). In Saudi Arabia, where lifestyle and dietary habits are rapidly evolving, understanding the nutritional status of students is critical for designing effective health promotion strategies(5).

The school environment itself plays a pivotal role in shaping student health. Factors such as building safety, ventilation, cleanliness, and food hygiene directly influence the physical well-being of students and staff. For example, poor ventilation can exacerbate respiratory conditions, while inadequate food storage practices may lead to foodborne illnesses. The Saudi Ministry of Education has established the School Health Affairs Department to oversee these aspects, yet localized assessments are necessary to ensure compliance with national standards and to identify region-specific challenges (2).

This study focuses on National Guard Iskan Al-Ahsa, a region with a unique demographic and socio-economic profile, to provide a detailed evaluation of both student health and school infrastructure. The specific objectives include assessing the prevalence of chronic illnesses, vision problems, scoliosis, and body mass index (BMI) among students, as well as evaluating the quality of school buildings, canteens, and food preparation practices. By employing a cross-sectional design and a robust sample size of 1,100 students, this study aims to generate reliable data that can guide localized and national school health policies.

The findings of this study will contribute to the broader literature on school health by highlighting regional disparities and successes in health outcomes and environmental conditions. Furthermore, the results will provide actionable insights for educators, healthcare providers, and policymakers to enhance the Saudi School Health Program, ultimately fostering a healthier and more productive student population. In doing so, this study aligns with global sustainable development goals, particularly those targeting good health and well-being (SDG 3) and quality education (SDG 4) (1).

In summary, this research underscores the importance of integrated school health assessments as a tool for early intervention and long-term health promotion. By addressing both individual health metrics and environmental determinants, this study offers a holistic approach to improving the well-being of children and adolescents in National Guard Iskan Al-Ahsa and serves as a model for similar evaluations in other regions.

1. **METHADOLOGY**

**Study Design**

This study employed a cross-sectional design to assess the health status of school-aged children and adolescents and evaluate school environmental conditions in National Guard Iskan Al-Ahsa, Saudi Arabia. The design enabled simultaneous data collection on health indicators and infrastructure quality during the 2024 academic year (5).

**Study Setting and Population**

The research was conducted across 15 schools (primary, intermediate, and high schools) under the National Guard Iskan Al-Hassa educational system in the Eastern Province. The target population comprised students aged 6–18 years meeting inclusion criteria: enrollment in participating schools, age 6–18, and consent from guardians. Students from non-National Guard schools were excluded (6).

**Sample Size and Sampling Technique**

A total of 799 students were enrolled using a census approach, wherein all eligible students within the age range at participating schools were invited to participate. This ensured representation across all school levels and demographic groups.

**Data Collection Instruments and Variables**

Data were collected through:

* **Structured Questionnaires**: Administered by Family medicine Residents and Public Health Specialists during school health camps, capturing:

1. Demographic data (age, gender, education level)
2. Health indicators (chronic illness history, vision problems, eyeglass use, scoliosis screening) (7) (8) (9).
3. Anthropometric measurements (height, weight for BMI calculation)

* **Environmental Assessment Checklists**: Used by researchers to evaluate:

1. School buildings (ventilation, emergency exits, cleanliness, safety equipment)
2. Canteens (food storage, hygiene, expiration dates)
3. Food preparation practices

**Pilot Testing and Validity**

A pilot study (n=50) was conducted to refine instruments. Two independent family medicine consultants reviewed questionnaires for content validity. Cronbach’s alpha (>0.7) confirmed internal consistency.

**Data Collection Procedure**

1. **Health Assessments**: Conducted during school hours by medical teams. Vision acuity was tested using Snellen charts; scoliosis screening followed the Adam’s forward bend test.
2. **Environmental Audits:** Performed by trained inspectors using standardized checklists over a 2-week period.

**Data Management and Analysis**

Data analysis done using SPSS version 27 (IBM Corp., 2020). Descriptive statistics, including frequencies and percentages, were calculated to summarize the bio-demographic characteristics and health-related variables. To assess the association between age groups and health outcomes, as well as the relationship between gender and health outcomes, Chi-square tests were employed. Exact probability tests were used where appropriate. Specifically, the analysis investigated vaccination status, body mass index, chronic illnesses, vision problems, eyeglass use, scoliosis, ADHD, and scoliosis examination results across different age and gender categories. Statistical significance was set at a p-value of less than 0.05

3. results and discussion

Table 1 presents the bio-demographic characteristics of 799 children and adolescents from National Guard Iskan Al-Ahsa schools. The students' ages ranged from 6 to 18 years, with 206 (25.8%) aged 6-9, 360 (45.1%) aged 10-13, and 233 (29.2%) aged 14-18, resulting in a mean age of 11.8 ± 3.3 years. Regarding gender, 499 (62.5%) students were male, and 300 (37.5%) were female. In terms of body mass index, 382 (47.8%) students were classified as underweight, 295 (36.9%) as normal weight, 82 (10.3%) as overweight, and 40 (5.0%) as obese. The participants' mean weight was 43.3 ± 19.4 kg, and the mean height was 144.8 ± 17.9 cm.

Table 1. Bio-demographic characteristics of children and adolescents in National Guard Iskan Al- Ahsa schools (N=799)

|  |  |  |
| --- | --- | --- |
| **Bio-demographic data** | **No** | **%** |
| **Age in years** |  |  |
| 6-9 | 206 | 25.8% |
| 10-13 | 360 | 45.1% |
| 14-18 | 233 | 29.2% |
| Mean ± SD | 11.8 ± 3.3 | |
| **Gender** |  |  |
| Male | 499 | 62.5% |
| Female | 300 | 37.5% |
| **Body mass index** |  |  |
| Underweight | 382 | 47.8% |
| Normal weight | 295 | 36.9% |
| Overweight | 82 | 10.3% |
| Obese | 40 | 5.0% |
| Weight (Mean ± SD) Kg | 43.3 ± 19.4 | |
| Height (Mean ± SD) cm | 144.8 ± 17.9 | |

Table 2 details the reported health problems and examination results of 799 children and adolescents from National Guard Iskan Al-Ahsa schools. A significant majority, 257 (86.2%), reported being vaccinated, while 41 (13.8%) were not. Chronic illnesses were reported by 110 students (13.8%), and vision problems by 134 (16.8%). Scoliosis was reported in 8 cases (1.0%). Notably, no students reported hearing problems. Regarding ADHD, 791 (99.0%) reported no diagnosis, while 5 (0.6%) reported ADHD, and 3 (0.3%) reported other related conditions (Attention Deficit or Hyperactivity). Scoliosis examinations revealed 580 (99.5%) expected results and 3 (0.5%) abnormal results. Hearing examinations showed 297 (100%) normal results and 0 abnormal results.

Table 2. Reported Health Problems and Examination Results in Children and Adolescents in National Guard Iskan Al- Ahsa schools (N=799)

|  |  |  |
| --- | --- | --- |
| **Data** | **No** | **%** |
| **Vaccination** |  |  |
| Yes | 257 | 86.2% |
| No | 41 | 13.8% |
| **Chronic** **illness** |  |  |
| Yes | 110 | 13.8% |
| No | 689 | 86.2% |
| **Vision problem** |  |  |
| Yes | 134 | 16.8% |
| No | 665 | 83.2% |
| **Hearing problem** |  |  |
| Yes | 0 | 0.0% |
| No | 300 | 100.0% |
| **Scoliosis** |  |  |
| Yes | 8 | 1.0% |
| No | 791 | 99.0% |
| **ADHD** |  |  |
| None | 791 | 99.0% |
| ADHD | 5 | 0.6% |
| Attention Deficit | 2 | 0.2% |
| Hyperactivity | 1 | 0.1% |
| **Scoliosis examination** |  |  |
| Normal | 580 | 99.5% |
| Abnormal | 3 | .5% |
| **Hearing examination** |  |  |
| Normal | 297 | 100.0% |
| Abnormal | 0 | 0.0% |

Table 3 presents the vision problems of 799 children and adolescents from National Guard Iskan Al-Ahsa schools. Among the students, 76 (9.5%) reported wearing eyeglasses, while 723 (90.5%) did not. For those with vision problems, the visual acuity range in the right eye was 3-60, with a mean of 8.9 ± 5.9. In the left eye, the visual acuity range was 3-36, with a mean of 8.7 ± 5.0.

Table 3. Vision Problems of Children and Adolescents in National Guard Iskan Al- Ahsa schools (N=799)

|  |  |  |
| --- | --- | --- |
| **Vision problems** | **No** | **%** |
| **Eye glass** |  |  |
| Yes | 76 | 9.5% |
| No | 723 | 90.5% |
| **Right eye** |  |  |
| Range | 3-60 | |
| Mean ± SD | 8.9 ± 5.9 | |
| **Left eye** |  |  |
| Range | 3-36 | |
| Mean ± SD | 8.7 ± 5.0 | |

Table 4 presents the age-specific prevalence of health well-being in 799 children and adolescents. Vaccination status showed a significant association with age (p=0.014), 93.5% of those aged 10-13 were vaccinated, compared to 82.9% of those aged 6-9. Body mass index also varied significantly with age (p=0.001). exact of 84.0% of children aged 6-9 were underweight, whereas this percentage decreased to 43.6% in the 10-13 age group and further to 22.3% in the 14-18 age group. Conversely, the prevalence of normal weight increased with age, from 13.1% in the 6-9 group to 41.9% in the 10-13 group, and 50.2% in the 14-18 group. Vision problems showed a significant age-related difference (p=0.002), with the prevalence increasing from 10.2% in the 6-9 age group to 16.7% in the 10-13 age group and 22.7% in the 14-18 age group. Scoliosis examinations also showed a significant difference (p=0.012), with 100% normal results in the 6-9 group and 99.4% in the 10-13 group, but a lower percentage of 95% in the 14-18 group. Chronic illnesses, eyeglasses use, scoliosis, and ADHD did not show statistically significant differences across the age groups (p>0.05).

Table 4. Age-Specific Prevalence of Health Well-Being of Children and Adolescents in National Guard Iskan Al- Ahsa schools (N=799)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Health item** | **Age in years** | | | | | | **p-value** |
| **6-9** | | **10-13** | | **14-18** | |
| **No** | **%** | **No** | **%** | **No** | **%** |
| **Vaccination** |  |  |  |  |  |  | .014\*^ |
| Yes | 170 | 82.9% | 87 | 93.5% | 0 | 0.0% |
| No | 35 | 17.1% | 6 | 6.5% | 0 | 0.0% |
| **Body mass index** |  |  |  |  |  |  | .001\* |
| Underweight | 173 | 84.0% | 157 | 43.6% | 52 | 22.3% |
| Normal weight | 27 | 13.1% | 151 | 41.9% | 117 | 50.2% |
| Overweight | 4 | 1.9% | 37 | 10.3% | 41 | 17.6% |
| Obese | 2 | 1.0% | 15 | 4.2% | 23 | 9.9% |
| **Chronic illness** |  |  |  |  |  |  | .059 |
| Yes | 22 | 10.7% | 61 | 16.9% | 27 | 11.6% |
| No | 184 | 89.3% | 299 | 83.1% | 206 | 88.4% |
| **Vision problem** |  |  |  |  |  |  | .002\* |
| Yes | 21 | 10.2% | 60 | 16.7% | 53 | 22.7% |
| No | 185 | 89.8% | 300 | 83.3% | 180 | 77.3% |
| **Eye glass** |  |  |  |  |  |  | .011 |
| Yes | 10 | 4.9% | 35 | 9.7% | 31 | 13.3% |
| No | 196 | 95.1% | 325 | 90.3% | 202 | 86.7% |
| **Scoliosis** |  |  |  |  |  |  | .189^ |
| Yes | 0 | 0.0% | 4 | 1.1% | 4 | 1.7% |
| No | 206 | 100.0% | 356 | 98.9% | 229 | 98.3% |
| **ADHD** |  |  |  |  |  |  | .060^ |
| ADHD | 4 | 1.9% | 1 | .3% | 0 | 0.0% |
| Attention Deficit | 2 | 1.0% | 0 | 0.0% | 0 | 0.0% |
| Hyperactivity | 0 | 0.0% | 1 | .3% | 0 | 0.0% |
| None | 200 | 97.1% | 358 | 99.4% | 233 | 100.0% |
| **Scoliosis examination** |  |  |  |  |  |  | .012\*^ |
| Normal | 204 | 100.0% | 357 | 99.4% | 19 | 95.0% |
| Abnormal | 0 | 0.0% | 2 | .6% | 1 | 5.0% |

*P: Pearson X2 test ^: Exact probability test*

*\* P < 0.05 (significant)*

Table 5 examines the sex-specific prevalence of health well-being among 799 children and adolescents. Vaccination rates showed a statistically significant difference (p=0.049), with a higher percentage of females (97.0%) being vaccinated compared to males (84.9%). Body mass index also displayed a significant association with gender (p=0.001). A higher percentage of males (54.1%) were underweight compared to females (37.3%), while a greater percentage of females (46.7%) were of normal weight compared to males (31.1%). (11, 12)Vision problems were significantly more prevalent in females (21.7%) than in males (13.8%) (p=0.004). Similarly, a significantly higher percentage of females (13.3%) used eyeglasses compared to males (7.2%) (p=0.004). Chronic illness, scoliosis, ADHD, and scoliosis examination results did not demonstrate statistically significant differences between males and females (p>0.05).

Table 5. Sex-Specific Prevalence of Health Well-Being of Children and Adolescents in National Guard Iskan Al- Ahsa schools (N=799)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Health item** | **Gender** | | | | **p-value** |
| **Male** | | **Female** | |
| **No** | **%** | **No** | **%** |
| **Vaccination** |  |  |  |  | .049\*^ |
| Yes | 225 | 84.9% | 32 | 97.0% |
| No | 40 | 15.1% | 1 | 3.0% |
| **Body mass index** |  |  |  |  | .001\* |
| Underweight | 270 | 54.1% | 112 | 37.3% |
| Normal weight | 155 | 31.1% | 140 | 46.7% |
| Overweight | 48 | 9.6% | 34 | 11.3% |
| Obese | 26 | 5.2% | 14 | 4.7% |
| **Chronic illness** |  |  |  |  | .626 |
| Yes | 71 | 14.2% | 39 | 13.0% |
| No | 428 | 85.8% | 261 | 87.0% |
| **Vision problem** |  |  |  |  | .004\* |
| Yes | 69 | 13.8% | 65 | 21.7% |
| No | 430 | 86.2% | 235 | 78.3% |
| **Eye glass** |  |  |  |  | .004\* |
| Yes | 36 | 7.2% | 40 | 13.3% |
| No | 463 | 92.8% | 260 | 86.7% |
| **Scoliosis** |  |  |  |  | .143^ |
| Yes | 3 | .6% | 5 | 1.7% |
| No | 496 | 99.4% | 295 | 98.3% |
| **ADHD** |  |  |  |  | .182^ |
| ADHD | 5 | 1.0% | 0 | 0.0% |
| Attention Deficit | 2 | .4% | 0 | 0.0% |
| Hyperactivity | 1 | .2% | 0 | 0.0% |
| No | 491 | 98.4% | 300 | 100.0% |
| **Scoliosis examination** |  |  |  |  | .978^ |
| Normal | 391 | 99.5% | 189 | 99.5% |
| Abnormal | 2 | .5% | 1 | .5% |

*P: Pearson X2 test ^: Exact probability test*

*\* P < 0.05 (significant)*

**Environmental assessment**

Table 6 presents the building assessment results for National Guard Iskan Al-Ahsa schools. The overall building condition, emergency exit availability, lighting, cleanliness, garden maintenance, and fire extinguishers were rated as excellent in both schools, representing 100% of the assessed buildings. Ventilation was rated as excellent in one school (50%) and good in the other (50%). The playground was also rated as excellent in one school (50%) and good in the other (50%). The condition of the WCs was rated as accepted in one school (50%) and good in the other (50%). First aid availability was rated as bad in one school (50%) and excellent in the other (50%).

**Environmental assessment**

Table 6. Environmental (Building) assessment in National Guard Iskan Al- Ahsa schools

|  |  |  |
| --- | --- | --- |
| **Building** | **No** | **%** |
| **Building** |  |  |
| Excellent | 2 | 100.0% |
| **Ventilation** |  |  |
| Excellent | 1 | 50.0% |
| Good | 1 | 50.0% |
| **ER Exit** |  |  |
| Excellent | 2 | 100.0% |
| **Light** |  |  |
| Excellent | 2 | 100.0% |
| **Cleanliness** |  |  |
| Excellent | 2 | 100.0% |
| **Garden** |  |  |
| Excellent | 2 | 100.0% |
| **Playground** |  |  |
| Excellent | 1 | 50.0% |
| Good | 1 | 50.0% |
| **WCs** |  |  |
| Accepted | 1 | 50.0% |
| Good | 1 | 50.0% |
| **Extinguishers** |  |  |
| Excellent | 2 | 100.0% |
| **First Aid** |  |  |
| Bad | 1 | 50.0% |
| Excellent | 1 | 50.0% |

Table 7 presents the environmental (canteen) assessment results for National Guard Iskan Al-Ahsa schools. Canteen cleanliness and the condition of food containers were rated as excellent in one school (50%) and good or not reported in the other (50%). Expiration dates, food handler certifications, food handler cleanliness, refrigerators, windows, PPE, and waste management were rated as excellent in both schools (100%). Devices and cleaning materials were rated as excellent in one school (50%) and good in the other (50%). Ventilation and mosquito nets were rated as excellent or good in one school (50%), respectively, and not reported in the other (50%).

Table 7. Environmental (Canteen) assessment in National Guard Iskan Al- Ahsa schools

|  |  |  |
| --- | --- | --- |
| **Canteen** | **No** | **%** |
| **Cleanliness** |  |  |
| Excellent | 1 | 50.0% |
| Good | 1 | 50.0% |
| **Food Containers** |  |  |
| Excellent | 1 | 50.0% |
| Not reported | 1 | 50.0% |
| **ExpirationDate** |  |  |
| Excellent | 2 | 100.0% |
| **Food handler Cer** |  |  |
| Excellent | 2 | 100.0% |
| **Food handler Clean** |  |  |
| Excellent | 2 | 100.0% |
| **Refrigerators** |  |  |
| Excellent | 2 | 100.0% |
| **Devices** |  |  |
| Excellent | 1 | 50.0% |
| Good | 1 | 50.0% |
| **Ventilation** |  |  |
| Excellent | 1 | 50.0% |
| Not reported | 1 | 50.0% |
| **Windows** |  |  |
| Excellent | 2 | 100.0% |
| **Mosquito Nets** |  |  |
| Good | 1 | 50.0% |
| Not reported | 1 | 50.0% |
| **PPE** |  |  |
| Excellent | 2 | 100.0% |
| **Waste** |  |  |
| Excellent | 2 | 100.0% |
| **Cleaning martials** |  |  |
| Excellent | 1 | 50.0% |
| Good | 1 | 50.0% |

Table 8 presents the environmental (food preparation) assessment results for National Guard Iskan Al-Ahsa schools. Food preparation was conducted on the same day in both schools, representing 100% of the assessed sites. Food preparation occurred inside the canteen in one school (50%) and was not reported in the other (50%). Food storage and wrapping practices were rated as excellent in both schools (100%).

Table 8. Environmental (food preparation) assessment in the National Guard Iskan Al- Ahsa schools

|  |  |  |
| --- | --- | --- |
| **Food preparation ion** | **No** | **%** |
| **Same Day** |  |  |
| Excellent | 2 | 100.0% |
| **Inside Canteen** |  |  |
| Excellent | 1 | 50.0% |
| Not reported | 1 | 50.0% |
| **Storage** |  |  |
| Excellent | 2 | 100.0% |
| **Wrapping** |  |  |
| Excellent | 2 | 100.0% |

**Limitations**

* Cross-sectional design limits causal inferences.
* Self-reported health history may introduce recall bias.
* Environmental assessments were observational, potentially subject to evaluator bias.

**Conclusion**

This comprehensive assessment of student health and school environmental conditions in National Guard Iskan Al-Ahsa schools reveals several critical findings with important implications for school health programs in Saudi Arabia. The study demonstrates significant age and gender disparities in health indicators, with notable findings including high rates of underweight status (47.8%) among students, increasing prevalence of vision problems with age (from 10.2% to 22.7%), and significant gender differences in vaccination rates (97.0% in females vs. 84.9% in males) and normal weight prevalence (46.7% in females vs. 31.1% in males).

The environmental assessments revealed generally positive conditions, with excellent ratings for most building safety and food hygiene parameters (15.16). However, variability in ventilation quality, playground conditions, and first aid availability points to areas needing targeted improvement. The strong performance in food preparation and storage practices (100% excellent ratings) serves as a model for other school districts.

These findings underscore three key recommendations: (1) Implementation of age-specific health interventions, particularly nutritional support for younger students and vision screening programs for adolescents; (2) Gender-sensitive health promotion strategies to address disparities in vaccination coverage and weight status; and (3) Standardization of environmental health protocols, with particular attention to ventilation systems and emergency preparedness (17, 18)

The study's dual focus on individual health metrics and institutional infrastructure provides a replicable model for comprehensive school health assessments. While the cross-sectional design limits causal interpretations, the robust sample size and standardized measurement protocols strengthen the validity of these findings. Future research should employ longitudinal designs to track the impact of interventions based on these findings and expand assessments to include mental health indicators.

This research contributes substantially to Saudi Arabia's National School Health Program by identifying specific, actionable areas for improvement while highlighting successful practices that can be scaled nationally. The integration of health and environmental assessments demonstrates the value of holistic approaches to school health, aligning with global sustainable development goals for health and education.

Ethical Approval and Consent :

Approval was obtained from the Institutional Review Board of King Abdullah International Medical Research Center. Participation was voluntary, with anonymous data stored securely. Guardians provided written informed consent

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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