



RELATIONSHIP BETWEEN LEAD EXPOSURE RISK AND AGGRESSIVE BEHAVIOR IN ADOLESCENTS 13-18 YEARS OLD

Anna Suraya^{1,2}, Jimmy Nixon Soriton³, Sandra Hakiem², Maryuni^{2,3}, Wan Nedra⁴, Mrunal Shetye⁵, Rooswanti Soeharno⁵, Anas Makruf⁶, Kristin Darunndiyah⁶, Stephan Boese O'Reilly⁷



¹ Occupational Safety and Health Study Program, Binawan University, Jakarta

² Master Program of Public Health, Binawan University, Jakarta

³ Midwifery Program, Binawan University, Jakarta

⁴ Faculty of Medicine, YARSI University, Jakarta

⁵ Unicef Indonesia

⁶ Ministry of Health of Republic Indonesia

⁷ Institute and Clinic for Occupational, Social and Environmental Medicine, University Hospital, LMU Munich, Munich, Germany



Introduction

Previous studies have reported a relationship between lead exposure and aggressive behavior in adolescents. Although sources of lead exposure have been widely identified in Indonesia, the relationship between lead exposure and aggressive behavior remains underexplored

Method

This cross-sectional study investigates the relationship between potential lead exposure and aggressive behavior in adolescents. The study subjects were middle and high school students aged 13 to 18 years residing in Jakarta. Data on the potential lead exposure were obtained using a lead exposure risk questionnaire from the Ministry of Health of the Republic of Indonesia, while data on aggressive behavior were collected using the Bush Perry Aggression Questionnaire Scale. The likelihood of aggressive behavior was analyzed using logistic regression.

Results

The study involved 488 subjects. Subjects with a potential lead exposure had a significantly higher likelihood of exhibiting aggressive behavior (adjusted OR = 10.0 95% CI = 1.32–76.2) compared to those not exposed. Subjects with three or more potential sources of lead exposure were found to have a substantially higher likelihood of exhibiting aggressive behavior (adjusted OR = 15.3, 95% CI = 1.98–118), suggesting a potential dose-response effect. Residing in older buildings with deteriorating wall paint or furniture emerged as the sole significant source of potential lead exposure associated with elevated aggressive behavior (adjusted OR = 2.83, 95% CI 1.59–5.01).

Tabel 1. Odds ratio and adjusted odds ratio of the association between aggressive behavior and Lead Exposure Potential, and Other Risk Factors (N=488)

| Risk Factors for Aggressive Behavior | OR (95% CI) | p | Adjusted OR (95% CI) | p |
|--|-------------------------------|--------------|-------------------------------|--------------|
| Potential Risk of Lead Exposure | | | | |
| None | 1 | | 1 | |
| Present | 11.313 (1,541-83,060) | 0.003 | 10,049 (1,326-76,184) | 0.000 |
| Number of Lead Exposure Sources | | | | |
| None | 1 | | 1 | |
| 1-2 | 8.259 (1.110-61.425) | 0.039 | 7.323 (0.955-56.172) | 0.05 |
| >=3 | 18.874 (2.519-141.440) | 0.002 | 15.327 (1.981-118.595) | 0.005 |
| Past Traumatic Events | | | | |
| None | 1 | | 1 | |
| Present | 3.362 (2.177-6.851) | 0.000 | 2.796 (1.478-5.288) | 0.002 |
| Exposure to Violent Media | | | | |
| Never | 1 | | 1 | |
| Rarely | 1.295 (0.534-3.141) | 0.568 | 1.214 (0.445-3.309) | 0.567 |
| Sometimes | 2.151 (0.940-4.923) | 0.070 | 2.285 (0.888-5.879) | 0.070 |
| Often | 1.806 (0.669-4.871) | 0.243 | 1.350 (0.423-4.309) | 0.662 |
| Very Often | 6.703 (2,328-19,303) | 0.000 | 4.816 (1.378-16.838) | 0.009 |
| Parental Attention | | | | |
| Very Attentive | 1 | | 1 | |
| Attentive | 1.263 (0.664-2.403) | 0.477 | 0.925 (0.465-1.841) | 0.944 |
| Neutral to Inattentive | 2.708 (1.517-4.833) | 0.001 | 1.881 (1.007-3.515) | 0.030 |

The OR and p value were calculated using logistic regression

Table 2. Odds ratio and adjusted odds ratio of the association between aggressive behavior and the Sources of Lead Exposure Potential (N=488)

| Risk Factors for Aggressive Behavior | OR (95% CI) | p | Adjusted OR (95% CI) | p |
|--|-----------------------------|--------------|-----------------------------|--------------|
| Residing in an old building with deteriorating wall paint or furniture | | | | |
| No | 1 | | 1 | |
| Yes | 3.121 (1.836-5.308) | 0.000 | 2.830 (1.598-5.012) | 0.000 |
| Living with family members who active smokers or have recently quit smoking | | | | |
| No | 1 | | 1 | |
| Yes | 1.679 (1.010-2.791) | 0.000 | 1.558 (0.906-2.680) | 0.109 |
| Past Traumatic Events | | | | |
| None | 1 | | 1 | |
| Present | 3.362 (2.177-6.851) | 0.000 | 3.155 (1.730-5.756) | 0.000 |
| Exposure to Violent Media | | | | |
| Never | 1 | | 1 | |
| Rarely | 1.295 (0.534-3.141) | 0.568 | 1.313 (0.517-3.335) | 0.567 |
| Sometimes | 2.151 (0.940-4.923) | 0.070 | 2.249 (0.937-5.398) | 0.070 |
| Often | 1,806 (0.669-4.871) | 0.243 | 1.264 (0.443-3.607) | 0.662 |
| Very Often | 6.703 (2,328-19,303) | 0.000 | 4.527 (1.455-14.087) | 0.009 |
| Parental Attention | | | | |
| Very Attentive | 1 | | 1 | |
| Attentive | 1.263 (0.664-2.403) | 0.477 | 0.925 (0.465-1.841) | 0.824 |
| Neutral to Inattentive | 2.708 (1.517-4.833) | 0.001 | 1.881 (1.007-3.515) | 0.048 |

The OR and p value were calculated using logistic regression

Conclusion

This study demonstrates a strong relationship between the potential lead exposure and aggressive behavior. Improved policies for preventing lead exposure are necessary to protect the health of adolescents and the community from the long-term impacts of lead exposure.

Acknowledgements

The authors extend their sincere gratitude to UNICEF Indonesia, MOH, and the principals of all participating schools for their invaluable support and contributions to this study.

Conflict of Interest

The authors declare no competing interests. This study was conducted independently from the author's institutional responsibilities.

Suraya, A. et al.(2025). Relationship Between Lead Exposure Risk And Aggressive Behavior In Adolescents 13-18 Years Old. Publication pending

