Journal of Community Medicine and Primary Health Care. 36 (2): 29 – 40
https://dx.doi.org/10.4314/jcmphc.v36i2.3

JOURNAL OF COMMUNITY MEDICINE AND PRIMARY HEALTH CARE

ORIGINAL ARTICLE

Profile of Intentional Self-Poisoning Cases among Adolescents at the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria – A 2-year review

Babatola AO,[1,2] Adeniyi AT,[1,2] Unegbu PEN,[2] Adebisi AO,[2] Ogundare EO,[1,2] Olofinbiyi BA,[3] Olatunya OS,[1,2] Fadare JO.[4]

[1] Department of Paediatrics, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria.
[2] Department of Paediatrics and Child Health, Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti State, Nigeria.
[3] Department of Obstetrics and Gynaecology, Ekiti State University/Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti State, Nigeria.
[4] Department of Pharmacology and Therapeutics, Ekiti State University/Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti State, Nigeria

Keywords

Intentional,

Poisoning,

Adolescents,

Paraquat,

Nigeria

ABSTRACT

Background: Intentional self-poisoning (Deliberate self-poisoning) is fast becoming a major public health problem, especially among adolescents. The period of adolescence is tumultuous for some adolescents. This study describes the socio-demographic profile of adolescents managed for intentional self-poisoning at the Paediatric Unit of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria

Methods: A retrospective descriptive study was conducted. The records of 10 adolescents managed for intentional self-poisoning from December 2021 to November 2023 were reviewed. Data extracted included age, sex, name of substances ingested, duration of admission and treatment outcome.

Results: There were 4(40.0%) males and 6(60.0%) females. The median age of adolescents with intentional self-poisoning was 15.0 years (interquartile range 13.0-15.3 years). The agents ingested were organophosphate 5(50.0%), paraquat 3 (30.0%) and substances not documented 2(20.0%). The mean (standard deviation) duration of admission was 1.7 (1.06) days. Six (60.0%) were discharged, 1(10.0%) left against medical advice and 3(30.0%) deaths were recorded. All the 3 that died ingested paraquat. Most of the patients took the substances because they were reprimanded for ill behaviours and 2(20.0%) had associated diagnosed psychiatric disorders.

Conclusion: In this study, there were more females with intentional self-poisoning and the mortalities were in those that ingested paraquat. Campaigns on the prevention of poisoning, particularly among adolescents, should be intensified. In addition, enforcement of regulations on lethal herbicides and pesticides is recommended. Furthermore, the establishment of poison control centres will help significantly in improving the outcome of care and research about preventive measures.

Correspondence to:
Dr Adefunke O Babatola,
Department of Paediatrics, Ekiti State University,
Ado-Ekiti, Ekiti State, Nigeria
adefunke.babatola@eksu.edu.ng

INTRODUCTION

Intentional self-poisoning (Deliberate self-poisoning) is fast becoming a major public health problem because of its alarmingly increasing rate among adolescents. It is a leading method of suicide among adolescents and suicide is the fourth leading cause of death among adolescents and young people aged 15-29 years old globally.[1-3] Adolescence is often challenging because of the rapid physiologic changes and developments occurring during the period. [4,5]Also, adolescents are faced with varying kinds of pressures from society, family, peers, and social media during adolescence. [5,6] There is a high prevalence of unhealthy coping mechanisms or behaviours such as avoidance, smoking, substance abuse, alcohol abuse, aggression and self-harm among adolescents.[7-9]

Researchers from across the globe have documented varying prevalence rates of intentional self-poisoning (ISP) among adolescents. In a multicentre (105 centres) study in Spain, 233 cases were reported over 1 year period (2013).[1] A study among Romanian adolescents reported 178 patients over 6 years (2016-2022) in a single centre[10] and a single centre study in Italy reported 267 cases of intentional self-poisoning through drug ingestion from 2014-2022.[11] In Israel, over 8 years (1990-1998), 324 cases were evaluated in a single centre study[2] whilst, using a national data repository, 6915 cases of deliberate self-poisoning were recorded from 2016 -2021 in the Netherlands.[12] Statistics on intentional self-poisoning among Nigerian adolescents are sparse. A 20-year retrospective review of all cases of poisoning amongst children managed at Federal Teaching Hospital, Gombe reported that only 2 of the cases were due to intentional poisoning.[13] Also, a previous study conducted at this study centre about 10 years ago documented that only 12 of all the 81 cases of poisoning amongst children younger than 18 years were due to intentional poisoning.[14] A study that reviewed all published works on poisoning among adolescents in Nigeria from 2000-2019 reported 24 cases over the period, out of which 17 were intentional.[15] There are also pockets of case reports of intentional self-poisoning among Nigerian adolescents in the literature.[16.17]

Studies have reported more cases of intentional self-poisoning among females.[2,18,19] Pharmaceutical and illicit drugs, alcohol, chemical substances, pesticides and herbal mixtures are some of the agents commonly implicated.[14.15.17] Why many adolescents with intentional self-poisoning engage in the act may be difficult to determine. However, factors associated with this problem include conflicts in the home and school, dysfunctional family, inadequate child-family communication, child abuse, adverse childhood experiences, poor health, bullying, low socioeconomic status, school difficulties, parental divorce, parenting styles, poor coping skills, the impact of COVID-19 pandemic and psychological disorders.[2,10,12,15,18-21] The outcome of management is variable and mostly dependent on

the agents involved and the availability of timely and appropriate interventions.[22-24] A profile of patients managed for intentional self-poisoning may help guide preparedness for management and prevention strategies to stem the rising tide of intentional self-poisoning among adolescents. This study aimed to assess the profile of adolescents managed for intentional self-poisoning at the Paediatrics Unit of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria.

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Frequency (%)
Age(years)	
Range (13-17)	
13	4(40.0)
15	4(40.0)
16	1(10.0)
17	1(10.0)
Residential Area	
Urban	8(80.0)
Rural	2(20.0)
Primary caregiver	
Both parents	3(30.0)
Father	2(20.0)
Mother	3(30.0)
Aunty	1(10.0)
Not documented	1(10.0)
Source of admission	
Walk in	7(70.0)
Referred from private facilities	3(30.0)

METHODOLOGY

A retrospective descriptive study was conducted to assess the profile of adolescents managed for intentional self-poisoning at the Paediatric Unit of Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti. EKSUTH is located in Ado-Ekiti, the State capital of Ekiti State, Nigeria. As of 2021, the population of Ekiti State was 4 million, out of which 25% were adolescents aged 10-19 years.[25] EKSUTH receives walk-in and referred patients from the state and its neighbouring states within a catchment area of about a 150 km radius.

Children and adolescents from ages 0-18 years are attended to at the Paediatric Unit of the Teaching Hospital. Paediatric emergencies are attended to at the children's emergency ward (CEW). The CEW is a 12-bedded ward manned by 3 Paediatric consultants, 4 resident doctors, 2 house officers, 15 nurses and about 10 support staff. The CEW has the basic equipment needed for emergencies; however, the facility does not

have an intensive care unit or paediatric intensivist.

Case notes of all adolescents admitted for ISP at the children's wards of EKSUTH from December 2021 to November 2023 were retrieved and reviewed. A checklist was used to extract information such as socio-demographic characteristics, agent ingested, circumstances surrounding the act, duration of admission and outcome of care from the patients' case notes.

Ethical approval (EKSUTH/A67/2024/01/013) was obtained from the Ethics and Research Committee of the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria.

Data analysis was performed using the Statistical Product and Service Solutions (SPSS) version 25 and results were presented as proportions, means, and median as appropriate. A p-value < 0.05 was taken as statistically significant.

Table 2: Circumstances Surrounding Intentional Poisoning

Variable	Frequency (%)
Reprimanded for ill-behaviour	
Stealing money or phone	5(50.0)
Losing money carelessly	1(10.0)
Unhealthy relationship with opposite sex	1(10.0)
Food refusal	1(10.0)
Verbal and emotional abuse from caregiver	**1(10.0)**
Not allowed to participate in a school activity (competition)	**1(10.0)**

RESULTS

Of the 1,964 patients that were admitted during the period of the review, 10 of them were managed for ISP giving a prevalence rate of 0.5%. There were 4(40.0%) males and 6(60.0%) females with a male-to-female ratio of 1:1.5. The median age of adolescents with intentional self-poisoning was 15.0 years (interquartile range 13.0-15.3 years). They were all (100%) in-school adolescents. (Table 1)

The agents ingested were organophosphate 5 (50.0%), paraquat 3 (30.0%) and substances not documented in two cases (20.0%). The most common presenting symptom was abdominal pain 8(80.0%), others included vomiting 3(30.0%), sore throat/difficulty with swallowing 2(20%), diarrhoea (10%), jaundice (10%), restlessness (10%), respiratory distress (10%) and altered consciousness (10%).

Most 8 (80%) of the patients took the substances because they were reprimanded for ill behaviour, 1 (10%) because the adolescent was not allowed to participate in a competition in school and 1 (10%) because of verbal and emotional abuse from a caregiver. Two (20.0%) of the adolescents had associated diagnosed psychiatric disorders. (Table 2)

Table 3 shows the mean (standard deviation) duration of admission was 1.7 (1.06) days and the range of duration of admission was 1-4 days.

Regarding the outcome of care, 6 (60.0%) of the patients recovered fully and were discharged, one (10.0%) left against medical advice and 3(30.0%) deaths were recorded. (Figure 1) All 3 cases that died ingested paraquat.

Table 3: Relationship between agent and outcome of admission

Agent	**Outcome**			**Total n (%)**	***LR (df)**
	Discharged	*DAMA	Died		
	n (%)	n (%)	n (%)		
Organophosphate	5(50)	0(0)	0(0)	**5(50)**	15.186 (4)
Paraquat	0(0)	0(0)	3(30)	**3(30)**	**0.004**
Not documented	1(10)	1(10)	0(0)	**2(20)**	
	6 (60)	1(10)	3(30)	**10(100)**	

***DAMA- Discharged Against Medical Advice**
***LR – Likelihood Ratio**

DISCUSSION

In this study, over a 2-year period, 10 adolescents were managed for intentional self-poisoning (ISP) at the study site. There may be a high prevalence of ISP among adolescents due to the influence of social media and technological advancements. Although earlier studies in Nigeria have reported fewer cases. A review of acute poisoning cases at the paediatric unit of a tertiary hospital in Gombe, North East Nigeria, showed that only two cases of intentional poisoning were managed over a 20-year (2000-2019) period.[13] Similarly, a review article that involved all cases of poisoning among Nigerian adolescents published between the periods of 2000 and 2019 reported only 17 ISP cases.[15] However, studies from developed countries showed a higher number of adolescent intentional self-poisoning cases, 178 cases over a 7-year period (2016-2022) in Romania,[10] and a total of 1,424 cases of ISP were reported among adolescents aged 10 – 17 years from the Dutch Poison Information Centre in the Netherlands.[12] One potential explanation for this variance could be attributed to certain Nigerian cultural practices, such as the extended family system. This system not only offers emotional and financial support to its members but also facilitates the sharing of family burdens and stress, among other benefits. These aspects may act protectively against documented risk factors of self-harm, such as social isolation. Also, a part of the Nigerian community's social values is to uphold the sanctity of life and disapprove of suicide or self-harm. This may also contribute to the low prevalence of self-poisoning in our study compared with reports from developed countries. The seemingly low reported cases of ISP may also be due to under-reporting, as the health statistics reporting system in Nigeria is

suboptimal.[26,27] Furthermore, it's important to note that there is no national data available on the actual prevalence of intentional self-poisoning (ISP) in Nigeria. This lack of data is due to the absence of a central registry or dedicated poison control centres where regional or national data could be collected and accessed.

The high prevalence of ISP among adolescents in developed countries may also be related to the widespread access to violence and related information on the internet. Though access to the internet by Nigerian adolescents seems to be increasing, it is still quite limited compared to developed countries. Also, most of the studies from developed countries were conducted in dedicated poison control centres with referrals from many peripheral facilities.[1,12,18,28]

In our study, the majority, 60% (6) of the ISP cases were females. This finding of having a higher proportion of females aligns with previous reports.[2,10,12] A study from Israel reported that 89% of the ISP cases reviewed were females.[2] Similar female predominance was also reported by studies from Romania and the Netherlands, where females accounted for 83% and 84.7% of the ISP cases.[10,12] This phenomenon could be potentially attributed to the influence of sex hormones, particularly oestrogens, on mood and mental health in females, especially during puberty, which is a transition period.[30] During puberty and adolescence, the brain undergoes continuous development, where actions are guided more by the amygdala, the part of the brain responsible for instinctual reactions, and less by the prefrontal cortex, the part of the brain responsible for reasoning.[30] Risky behaviour is common at this time and girls are given slightly to depressive/suicidal/self-harm behaviour.[7,31.] Furthermore, it has been speculated that hormonal fluctuations in females may be a trigger for depression. [32,33]

Organophosphate (insecticide) was the agent involved in one-half of our cases. Previous studies from developed and developing countries have reported that organophosphates are commonly used by youths for self-poisoning.[13,14,28] In a Nigerian study, two (100%) cases of ISP in their study ingested organophosphate.[13] In the same vein, some researchers from Egypt documented that organophosphates were the agents ingested in about 20% of the ISP cases in their study.[28] At variance with our findings are reports from some developed countries that observed that pharmaceutical drugs such as paracetamol, benzodiazepine, and antidepressants are the leading agents.[12,18] Other agents commonly implicated in ISP among adolescents include pesticides, herbicides, hydrocarbons, herbal mixtures and plant extracts.[14,.15,.34] It appears that adolescents have access to harmful agents in their localities. In low-income countries such as Nigeria, cheap and locally made organophosphate preparations, either as insecticides, or rodenticides used for the elimination of rodents and insects, are widely available with their sales unregulated.[16,35,36]

One of the factors that influence the outcome of

care for poisoned patients is the type of substance ingested.[37] The mortalities (30%) recorded in our study were in patients who ingested paraquat. Studies have shown paraquat poisoning to be associated with a high mortality rate. [37-39] Currently, there is no known antidote for paraquat poisoning. Advanced health interventions, such as intensive care, may be necessary to successfully manage this condition.[4] The absence of an intensive care unit at the study centre may contribute to the high mortality rates observed.

In our study, 80% of the adolescents engaged in self-poisoning because they were reprimanded for ill behaviours. Previous studies have reported adolescents engaging in ISP for related reasons.[8,16,17] This observation may be related to peer pressure, the influence of social media and exposure to some movies promoting violence and such unhealthy acts. Other circumstances surrounding ISP in our study were verbal abuse by a caregiver (10%) and denial of the opportunity to participate in a school competition (10%). This suggests a need for more education/training on effective parenting, particularly to parents and caregivers of adolescents.

A major limitation of our study is that it was conducted in a single centre and a few cases were reviewed. Also, the retrospective nature of data collection is prone to missing data.

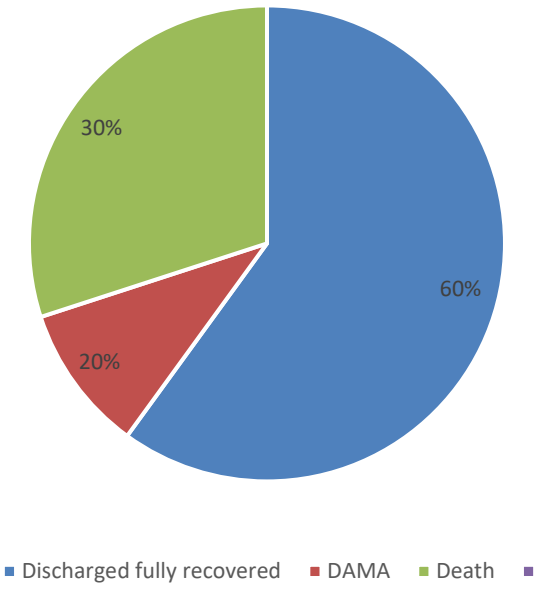

Figure 1: Distribution of outcome of admission

DAMA- Discharge against medical advice

CONCLUSION

In this study, ISP was associated with a high mortality rate and paraquat remains a lethal poison. Therefore, we recommend that there should be strict monitoring and enforcement of regulations regarding the use and sales of herbicides and pesticides. Also, public enlightenment campaigns on the dangers inherent in paraquat poisoning through various media channels, including social media will assist in reaching more people. In addition, adolescent mental health programs should be strengthened nationally to build adolescents' capacity to deal with and cope with difficult situations.

Acknowledgement: The authors appreciate Mr. Mustapha of the medical records department of Ekiti State University Teaching Hospital, Ado-Ekiti, for retrieving case notes.

Conflict of Interest: The authors declare no conflict of Interest associated with this study.

Contribution to joint publication: All authors listed meet the criteria for authorship.

REFERENCES

1. Gonzalez-Urdiales P, Kuppermann N, Dalziel SR, Prego J, Benito J, Mintegi S. Pediatric Intentional Self-Poisoning Evaluated in the Emergency Department: An International Study. Pediatr Emerg Care 2021;37(12):e1631–1636. DOI: 10.1097/PEC.0000000000002141
2. Lifshitz M, Gavrilov V. Deliberate Self-Poisoning in Adolescents. Isr Med Assoc J 2002;4(4):252–254.
3. World Health Organization. Suicide [Internet]. [cited 2024 Jan 31]. Available from: https://www.who.int/news-room/fact-sheets/detail/suicide
4. World Health Organization. Adolescent Health [Internet]. [cited 2024 Jan 31]. Available from: https://www.who.int/health-topics/adolescent-health
5. World Health Organization. Coming of Age: Adolescent Health [Internet]. [cited 2024 Jan 31]. Available from: https://www.who.int/news-room/spotlight/coming-of-age-adolescent-health
6. National Academies of Sciences Engineering and Medicine, Division of Health and Medicine, Division of Behavioural and Social Sciences and Education, Board on Children Youth and Families, Committee on the Neurobiological and Socio-Behavioral Science of Adolescent Development and Its Applications. Backes EP, Bonnie RJ. Adolescent Development. In: The Promise of Adolescence: Realizing Opportunity for All Youth [Internet]. National Academies Press (US); 2019 [cited 2024 Jan 31]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK545476/
7. Irshad S. Developmental Challenges, Psychosocial Problems, and Risk-taking

Behavior among Adolescents and their Psychological Solution. Int J Indian Psychol [Internet]. 2022[cited 2024 Jan 31];10(2). Available from: https://ijip.in/articles/developmental-challenges-psychosocial-problems-and-risk-taking-behavior-among-adolescents-and-their-psychological-solution/ DOI: 10.25215/1002.013

8. Sharma MK, Marimuthu P. Prevalence and Psychosocial Factors of Aggression among Youth. Indian J Psychol Med. 2014;36(1):48–53. DOI: 10.4103/0253-7176.127249
9. Obadeji A, Kumolalo BF, Oluwole LO, Ajiboye AS, Dada MU, Ebeyi RC. Substance Use among Adolescent High School Students in Nigeria and its Relationship with Pychosocial Factors. J Res Health Sci. 2020;20(2):e00480. DOI: 10.34172/jrhs.2020.15
10. Predescu E, Calugar L,Bibu-monus C, Sipos R.| Trends and Prevalence of Hospital Admissions Related to Deliberate Self-poisoning and Used Substances in Romanian Adolescents between 2016 and 2022. Children (Basel) 2023;10(5):790 [Internet]. [cited 2024 Jan 31]. Available from: https://www.mdpi.com/2227-9067/10/5/790 **https://doi.org/10.3390/children10050790**
11. Roversi M, Martini M, Musolino A, Pisani M, Zampini G, Genuini L, et al. Drug Self-Poisoning in Adolescents: A report of 267 cases. Toxicol Rep. 2023 ;10:680–685. DOI: 10.1016/j.toxrep.2023.05.012
12. Koppen A, Thoonen IMJ, Hunault CC, van Velzen AG, de Lange DW, Rietjens SJ. Significant Increase in Deliberate Self-Poisonings among Adolescents during the Second Year of the COVID-19 Pandemic. J Adolesc Health Off Publ Soc Adolesc Med. 2023 ;73(2):319–324. DOI: 10.1016/j.jadohealth.2023.02.041
13. Isaac WE, Iliya J, Adamu S, Apllos D, Oyeniyi C. Spectrum of Poisoning and Outcome among Children in a Tertiary Hospital, North-East Nigeria: A 20 Years Retrospective Review, 2000-2019. Open Journal of Pediatrics. 2022;12(1):100–124. [Internet]. [cited 2024 Jan 31]. Available from: https://www.scirp.org/journal/paperinformation?paperid=115437 **DOI:** 10.4236/ojped.2022.121012
14. Olatunya OS, Isinkaye AO, Ogundare EO, Oluwayemi IO, Akinola FJ. Childhood Poisoning at a Tertiary Hospital in South-West Nigeria. J Nepal Paediatric Soc. 2015; 35(2): 103–110.
15. Igbinosa IH, Igharo OG, Okoh AI. An Appraisal of Poisoning Patterns among Adolescent Patients Admitted into Tertiary Care Hospitals in Nigeria. Univ Lagos J Basic Med Sci 2022;10(1-2):97-104 [Internet] [cited 2024 Jan 31];10(1–

2). Available from: https://jbms.unilag.ng/index.php/jbms/article/view/219

16. Eze JN, Ndu IK, Edelu BO. Teenage Organophosphate Insecticide Poisoning: An Ugly Trend in Enugu, Nigeria. Journal of Community Medicine and Primary Health Care. 2018;30(1):99-108
17. **A**depoju AA, Asinobi AO, Ademola AD, Akinyinka OO, Abioye O, Adelaja A, et al. Zinc Phosphide (Rodenticide) Poisoning: A Case Report of Deliberate Self-harm in An Eleven-year-old. Niger J Paediatr. 2022;49(1):90–4. DOI:10.4314/njp.v49i1.15
18. Nistor N, Jitareanu C, Frasinariu OE, Ciomaga IM, Rugina AL, Streanga V. Epidemiologic Profile and Triggering Factors of Voluntary Poisoning in Teenagers. Medicine (Baltimore). 2017;96(5):e5831. DOI: 10.1097/MD.0000000000005831
19. Bhanuprakash MR, Shiruthi K, Sivakumar V, Sajjan VS, Lakshmi M, Kariyappa M. Profile of Acute Poisoning in Adolescents from Southern India. Journal of Clinical and Diagnostic Research. 2023;17(10): Sc01-Sc05. **DOI: https://doi.org/10.7860/JCDR/2023/58861.18536**
20. Coll X, Law F, Tobias A, Hawton K, Tomas J. Abuse and Deliberate Self-Poisoning in Women. A Matched Case-Control Study. Child Abuse Negl.2001 25(10)1291-302. DOI: 10.1016/s0145-2134(01)00276-9
21. Olibamoyo O, Ola B, Coker O, Adewuya A, Onabola A. Trends and Patterns of Suicidal Behaviour in Nigeria: Mixed-Methods Analysis of Media Report from 2016 to 2019. S Afr J Psychiatr. 2021;27:1572. DOI: 10.4102/sajpsychiatry.v27i0.1572
22. Rajbanshi LK, Arjyal B, Mandal R. Clinical Profile and Outcome of Patients with Acute Poisoning Admitted in Intensive Care Unit of Tertiary Care Center in Eastern Nepal. Indian J Crit Care Med Peer-Rev Off Publ Indian Soc Crit Care Med. 201822(10):691–6. DOI: 10.4103/ijccm.IJCCM_207_18
23. Teym A, Melese M, Fenta E, Ayenew T, Fentahun F, Tegegne E, et al. Patterns, Clinical Outcome, and Factors Associated with Poisoning Outcomes among Poisoned Patients in Northwest Ethiopia. SAGE Open Nurs. 2024;10:23779608231226081. DOI: 10.1177/2377960823122608
24. Aher AL, Shingade PU. Clinical Profile and In Hospital Outcome of Acute Poisoning Cases Admitted in Tertiary Care Hospital: A Prospective Observational Study. Vidarbha J Intern Med 2023;33(1):3-9. DOI: 10.25259/VJIM_33_2022
25. Bureau of Statistics – Ekiti State Website [Internet]. [cited 2024 Feb 2]. Available

from: https://www.ekitistate.gov.ng/executive-council/mdas/bureau-of-statistics/

26. Omoleke SA, Tadesse MG. A Pilot Study of Routine Immunization Data Quality in Bunza Local Government area: Causes and Possible Remedies. Pan Afr Med J. 2017 Aug 2;27:239 DOI: 10.11604/pamj.2017.27.239.11875
27. Alobo IG, Soyannwo T, Ukponwan G, Akogu S, Akpa AM, Ayankola K. Implementing Electronic Health System in Nigeria: Perspective Assessment in a Specialist Hospital. Afr Health Sci. 2020 Jun;20(2):948–54. DOI: 10.4314/ahs.v20i2.50
28. Mostafa .H, Rezk.N, Khater.A, Abdulaziz. S : Pattern and Severity of Acute Poisoning among Adolescents: A Six months Prospective Study in Poison Control Center. Ain Shams University Hospitals. Ain Shama Journal of Forensic and Clinical Toxicology, 2014;23(2):160-172. DOI: 10.21608/AJFM.2014.18762
29. Staff NA. The Effects of Teenage Hormones on Adolescent Emotions [Internet]. Newport Academy. 2022 [cited 2024 Feb 2]. Available from: https://www.newportacademy.com/resources/empowering-teens/teenage-hormones-and-sexuality/
30. Arain M, Haque M, Johal L, Mathur P, Nel W, Rais A, Sandhu R, Sharma S. Maturation of the Adolescent Brain. Neuropsychiatr Dis Treat. 2013;9:449-61. DOI: 10.2147/NDT.S39776. Epub 2013 Apr 3. PMID: 23579318; PMCID: PMC3621648
31. Op de Macks ZA, Bunge SA, Bell ON, Wilbrecht L, Kriegsfeld LJ, Kayser AS, Dahl RE. Risky Decision-Making in Adolescent Girls: The Role of Pubertal Hormones and Reward Circuitry. Psychoneuroendocrinology. 2016 Dec;74:77-91. DOI: 10.1016/j.psyneuen.2016.08.013
32. Soares CN, Zitek B. Reproductive Hormone Sensitivity and Risk for Depression across the Female Life Cycle: A Continuum of Vulnerability? J Psychiatry Neurosci 2008;33(4):331.
33. Kundakovic M, Rocks D. Sex Hormone Fluctuation and Iincreased Female Risk for Depression and Anxiety Disorders: From Clinical Evidence to Molecular Mechanisms. Front Neuroendocrinol. 2022;66:101010. DOI: 10.1016/j.yfrne.2022.101010
34. Yimaer A, Chen G, Zhang M, Zhou L, Fang X, Jiang W. Childhood Pesticide Poisoning in Zhejiang, China: A Retrospective Analysis from 2006 to 2015. BMC Public Health. 2017 Jun 28;17(1):602. DOI: https://doi.org/10.1186/s12889-017-4505-3

35. Atanda AT, Yusuf I, Faro RO. Autopsy Findings in Paediatric Poisoning with Otapiapia. Niger J Basic Clin Sci. 2018;15(1):98. *DOI:* 10.4103/njbcs.njbcs_23_17
36. Musa U, Hati SS, Mustapha A, Magaji G. Dichlorvos Concentrations in Locally Formulated Pesticide (Ota-piapia) Utilized in Northeastern Nigeria. Scientific Research and Essay. 2010;5(1):049-54.
37. Buckley NA, Fahim M, Raubenheimer J, Gawarammana IB, Eddleston M, Roberts MS, et al. Case Fatality of Agricultural Pesticides after Self-Poisoning in Sri Lanka: A Prospective Cohort Study. Lancet Glob Health. 2021 Jun 1;9(6):e854–62. DOI: 10.1016/S2214-109X(21)00086-3
38. Delirrad M, Majidi M, Boushehri B. Clinical Features and Prognosis of Paraquat Poisoning: A Review of 41 Cases. Int J Clin Exp Med. 2015 May 15;8(5):8122–8.
39. Halesha BR, Venugopal K. Clinical Spectrum and Outcome of Paraquat Poisoning in a Tertiary Care Teaching Hospital. Int J Adv Med. 2018 Jul 23;5(4):814–7. DOI: http://dx.doi.org/10.18203/2349-3933.ijam20182464
40. Kanchan T, Bakkannavar SM, Acharya PR. Paraquat Poisoning: Analysis of an Uncommon Cause of Fatal Poisoning from Manipal, South India. Toxicol Int. 2015;22(1):30–4. DOI: 10.4103/0971-6580.172253