



Examination of the Impact of Bleaching Cream Usage, Social Influences, and Environmental Factors on the Prevalence of Melasma among Students at Federal University Otuoke, Bayelsa State.

Onu, Benefit

Department of Biology/Environmental Management and Toxicology, Faculty of Science,
Federal University Otuoke.

ABSTRACT

This research work focuses on the effects of bleaching creams, social and environmental factors on the prevalence of melasma among students in Federal University Otuoke, Bayelsa State. A descriptive research design was adopted with a sample size of 385 drawn from the population of 10,000 students. The study used both primary and secondary data, questionnaires and Key Informant method were applied. This study reveals that 65% of respondents use bleaching cream regularly, 36% agreed that they were motivated to use bleaching cream to lighten their skin complexion. 36% are aware of the potential risks associated with bleaching creams. Their continuous usage of bleaching cream is borne out of the psychological and social satisfaction that they derive. 31% of the respondents are aware of the skin disorder called melasma. 58% of respondents agree that bleaching cream can contribute to the development of melasma. 70% of respondents who are using bleaching creams were observed to have melasma at different levels on their skin. 61% of respondents agreed that environmental factors such as exposure to the ultra violet rays of the sun and some pollutants in the environment can contribute to the development and prevalence of melasma. 61% of respondents agreed that societal discrimination over skin colour plays a role in the continuous use of bleaching cream. 77% of respondents viewed that socio-economic status and media influence also plays a role in the student's continuous use of bleaching creams as well as cultural and peer pressure.

ARTICLE'S INFO

Article No.: 082525148

Type: Research

Full Text: [PDF](#), [PHP](#), [HTML](#), [EPUB](#), [MP3](#)

DOI: [10.15580/gjemps.2026.1.082525148](https://doi.org/10.15580/gjemps.2026.1.082525148)

Accepted: 27/08/2026

Published: 17/09/2026

Keywords: *Bleaching Cream, Social Factors, Environmental Factors, Prevalence of Melasma*

*Corresponding Author

Onu Benefit

E-mail: Benefitonu28@gmail.com;
onub@fuotuke.edu.ng

Article's QR code



INTRODUCTION

The skin is the human body's largest organ and represents the first barrier to environmental exposure acting as physical barrier and protecting from the assault of foreign organisms or toxic substances. The surface of the skin is a primary site for the deposition and introduction of microorganisms. The outermost skin layer (the epidermis) provides the first line of defense against pathogens (Zouboulis & Chen, 2018). Therefore, the deeper layers of the skin (dermis) remain free of infection suggesting that skin has the ability to protect against invading microbes. Moreover, the skin is also colonized by a complex microbial population that includes bacteria, fungi, and viruses, most of which are harmless or in some cases even beneficial to their host. The complex microbial populations that colonize the human body form the human microbiome. The composition of these microbial communities depends on skin characteristics such as sebaceous gland concentration, moisture content, temperature, as well as host genetics and environmental factors (Handel *et al.*, 2014; Byrd, Belkaid & Segre, 2018). A complex relationship exists between host and micro-organisms and for this reason the presence of pathogens and the imbalance and/or perturbation in the commensal ecosystem have been associated with skin disease. Skin diseases are an important cause of morbidity in the community. They are associated with significant psychological effects and suicidal ideation in some cases (Ferguson & Dummer, 2017).

Skin whitening is used interchangeably with skin bleaching or skin lightening is the act of brightening of the skin complexion using substances, mixtures or physical treatments (Akinkugbe & Adeyemi, 2019). Skin whitening is used for aesthetic or cosmetic reasons to increase skin glow, radiance and vibrancy in addition to the lightening. Skin bleaching has become a common trend, especially in trans-Saharan West Africa. Skin lightening involves the use of a wide range of products, applied to specific or widespread area of the skin to lighten the normal black skin for fame, cosmetic purpose and also due to misconceptions about the presumed superiority and desirability of fair skin (Akinkugbe & Adeyemi, 2019).

Skin bleaching is a product that improves and lightens the skin tone by reducing the amount of melanin being produced by the skin. Some people including students in the Federal University Otuoke, bleach their skin for special events, others as more of everyday practice. Some people bleach their skin or parts of their bodies while others bleach their faces alone (Mireku, 2020). Some of the reasons include that the skin is perceived to be too dark; preference for light skin, because light skin is seen as beautiful; the practice is seen as fashionable, modern and facilitates social mobility; a response to peer influence; and to attract potential spouses.

Melasma is a manifestation disorder of hypermelanosis. The incidence of melasma leads to the occurrence of disorders of the skin while causing a

decrease in confidence in the sufferer. Melasma is generally symmetrical macular-shaped macula that is not evenly brown to old; it comes from ultra violet rays in sunlight with a predilection of the cheeks, forehead, upper lip, nose and chin. Medically melasma is a health problem, and aesthetically can damage the beauty of women and men (Boonstra & Van der Geer, 2018). Melasma is a common acquired, chronic, recurrent, symmetric hypermelanosis characterized by irregular light to gray-brown macules and patches with well-defined margins on sun exposed areas of the body. Etiologic factors in the pathogenesis of melasma include genetic influences, exposure to UV radiation, pregnancy, hormonal therapies (including oral contraceptives (OCP) and thyroid hormones), cosmetics, phototoxic drugs, and antiseizure medications (Pathak & Pandya, 2021). Melasma has been attributed to an elevation of melanocyte-stimulating hormone, estrogen, and progesterone leading to increased melanogenesis (Pathak & Pandya, 2021). The actual pathogenicity of melasma is not yet fully understood. Various factors and causes are responsible for the pathogenesis of melasma, but a genetic predisposition and solar radiation (UV radiation and visible light) may be the two most important factors (Lee, 2012; Bhat & Dar, 2022).

MATERIALS AND METHODS

Study Area

The study area of this research work is Federal University Otuoke. The Federal University Otuoke (FUO) is one of the Federal Universities established by the Federal Government of Nigeria in February 2011 in cognizance of the need to bridge the great divide between the educationally advantaged and disadvantaged sections of the country, especially areas where universities were lacking. Sited in the serene and secure Otuoke Community, at the heart of the oil-rich Niger-Delta region of Bayelsa State, the University which is about 21 kilometers south of the state capital Yenagoa, occupies an expanse of about 200 hectares. The coordinates of the Federal University Otuoke, Bayelsa State, Nigeria is approximately 4.5736° N latitude and 6.1590 ° E longitudes. The weather and climate conditions of this region are influenced by its location in the Niger Delta region, which experiences a tropical climate characterized by high temperatures, humidity, and heavy rainfall.

Population of the Study

The target Population of the study consist of the 10,000 (Ten thousand) registered students admitted into the Federal University Otuoke, Bayelsa State in all the faculties and departments in Federal University Otuoke. This is limited to only undergraduate students of the institution.

Taro Yamane's formula is given as;

Sample Size

The students of Federal University Otuoke as at the time of this research are 10,000. TARO YAMANE (1967) formula was used to calculate a reliable sample size.

$$n = \frac{N}{1+N(e)^2}$$

Where N = Population of study (10,000)

n = Sample size (?)

e = Level of significance at 5% (0.05)

1 = Constant

$$n = \frac{10,000}{1 + 10,000 (0.05)^2} = \frac{10,000}{1 + 10,000 (0.0025)} = \frac{10,000}{1 + 25}$$

$$n = \frac{10,000}{26}$$

$$n = 384.6153, n \approx 385$$

Methods of Data Collection

Primary data were collected from the sampled population through the use of a semi-structured questionnaire which was accompanied by a list of all possible alternatives from which respondents selected answers of their best described situation. Data was also collected from the sampled population through the use of key informants from the Department of Environmental Management and toxicology. Secondary data were collected from textbook, journals, and online materials.

Data Analysis

The data for this research were analysed descriptively. The results were presented in tabular form

RESULTS AND DISCUSSION

Table 1: Questionnaire Distribution and Collection

Questionnaire	Level of Responses	Percentages
Number distributed	385	100%
Number Retrieved	352	91%
Numbers not retrieved	33	9%

A total of three hundred and eighty-five (385) questionnaires were administered, but three hundred and fifty-two (352) were retrieved.

Table 2: Biodata of Respondents

Age of respondents	Frequency	Percentage
15 – 20	118	33.53%
21 – 25	134	37.98%
26 – 30	62	17.50%
31 and above	38	10.97%
Sex of respondents	Number of respondents	Percentage of respondents
Male	155	44%
Female	197	56%
Marital status of respondents	Number of respondents	Percentage of respondents
Single	320	91%
Married/cohabiting	32	9%

The data provided in table 2 represents the distribution of respondents across different categories: age, sex and marital status. In terms of age, the majority of respondents fall within the 21-25 age range, accounting for 37.98% of the total sample. The second-largest age group is 15-20, comprising 33.53% of the respondents. The distribution is relatively balanced across the other age categories, with 26-30 representing 17.50%, and 31 and above representing 10.97%.

The data shows that there is a slightly higher representation of females, accounting for 56% of the total respondents, while males make up the remaining 44%.

The sampled population is dominated with youths that are single having 91% while married/cohabiting respondents are 9%.

Table 3: Responses on the effects of bleaching cream on the prevalence of melasma among students in Federal University Otuoke

QUESTIONS	RESPONSE	FREQUENCY	PERCENTAGE
Have you ever used bleaching cream to lighten your skin?	YES NO MAYBE	233 106 13 352	66.2% 30.1% 3.7% 100%
How long have you been using bleaching cream	1year 2years 3years 4years	33 57 102 160 352	9.4% 16.2% 29% 45.4% 100%
What motivated you to start using bleaching creams?	To reduce dark spots on the skin caused by sunburn To alter skin tone Due to the effects of extreme weather conditions on my skin To counteract the effects of chemical exposure on my skin	136 92 71 53 352	38.6% 26.1% 20.2% 15.1% 100%
Are you aware of any potential risk associated with using bleaching creams?	YES NO MAYBE	293 43 16 352	83.2% 12.2% 4.6% 100%
Have you ever experienced any negative side effects from using bleaching creams?	YES NO MAYBE	182 96 74 352	51.7% 27.3% 21% 100%
Have you heard of the skin disorder called melasma?	YES NO MAYBE	104 198 50 352	30% 56% 14% 100%
Do you know anyone who has melasma?	YES NO MAYBE	182 78 92 352	52% 22% 26% 100%
Do you think that the use of bleaching creams can contribute to the development of melasma?	YES NO MAYBE	194 105 53 352	55.1% 29.8% 15.1% 100%
Do you have melasma?	YES NO MAYBE	251 71 30 352	71.3% 20.2% 8.5% 100%

From table 3 above, it is evidenced that 65% of respondents have used bleaching creams regularly to lighten their skin, where 43% of respondents have been using bleaching creams for over 4years. 36% agree that they were motivated to use bleaching cream to lighten their skin colour. 31% of the respondents are aware of the potential risks

associated with bleaching creams. However, 31% of respondents agree to have heard of the skin disorder called melasma. While about 50% of respondents know who has been diagnosed of melasma and 58% do believe that bleaching creams can contribute to the development of melasma. Lastly, 70% of respondents have been diagnosed with melasma.

Table 4: Responses on the role of Environmental factors on the prevalence of melasma among Students in Federal University Otuoke.

QUESTIONS	RESPONSE	FREQUENCY	PERCENTAGE
Are you aware of environmental factors that can trigger melasma, such as exposure to ultraviolet radiation (sun)	A	128	36.4%
	SA	82	23.3%
	ND/NA	0	0%
	D	63	17.9%
	SD	79	22.4%
	Total	352	100%
Do climatic factors such as high temperature, global warming and ozone layer depletion influence the severity of melasma?	A	220	62.5%
	SA	56	15.9%
	ND/NA	0	0%
	D	48	13.6%
	SD	28	8%
	Total	352	100%
Do melasma symptoms change during different seasons or when living in different geographical location?	A	15	4.2%
	SA	35	9.9%
	ND/NA	242	68.7%
	D	24	6.7%
	SD	37	10.5%
	Total	352	100%

Note; A= Agree SA= Strongly Agree ND/NA= Neither Disagree/Neither Agree
D= Disagree SD= Strongly Disagree

Table 4 shows that 34% of the respondents confirmed that there are known environmental factors that can trigger melasma, such as exposure to ultraviolet radiation (sun). Also, respondents (61%) agreed that climatic factors such as high temperature, global warming and ozone layer depletion influence the

severity of melasma. Furthermore, 67% of respondents neither agree nor disagree that melasma symptoms change during different seasons or when living in different geographical location. This is due to the fact that few students know about melasma.

Table 5: Responses on Socio-cultural factors that influence the use of bleaching cream and the prevalence of melasma among students in Federal University Otuoke.

QUESTION	RESPONSE	FREQUENCY	PERCENTAGE
Do you feel that societal attitudes towards skin colour play a role in the occurrence of melasma?	A	221	62.8%
	SA	56	15.9%
	ND/NA	25	7.1%
	D	19	5.4%
	SD	31	8.8%
	Total	352	100%
Does discrimination based on skin colour leads to the prevalence of melasma in certain populations?	A	118	33.5%
	SA	64	18.2%
	ND/NA	32	9%
	D	60	17.3%
	SD	78	22%
	Total	352	100%
Do you agree that socioeconomic status affects an individual's risk of developing melasma?	A	274	77.8%
	SA	34	9.7%
	ND/NA	0	0%
	D	27	7.7%
	SD	17	4.8%
	Total	352	100%
Does media presentation and advertising influence perceptions of melasma within the cultural context?	A	274	77.8%
	SA	27	7.7%
	ND/NA	0	0%
	D	34	9.7%
	SD	17	4.8%
	Total	352	100%

Table 5 above provides valuable insights into the socio-cultural factors that influence the use of bleaching creams among students in Federal University Otuoke. 61% of the respondents confirmed that they feel that societal attitudes towards skin colour play a role in the occurrence of melasma. Also, 61% of respondents agreed that discrimination based on skin colour affects the prevalence of melasma in certain populations. Furthermore, 77% of respondents agreed that socioeconomic status affects an individual's risk of developing melasma. Lastly, 77% of respondents agreed that media representation and advertising influence the perception of melasma within the cultural context.

DISCUSSION OF FINDINGS

The study on the effects of bleaching cream and environmental factors on the prevalence of melasma among students in Federal University Otuoke, made use of both primary and secondary sources of data to deduce findings through the use of literature, a survey questionnaire and interview with students and professionals. Several findings were made through these methods.

The study revealed that the most prevalent bleaching cream found among and used by students of Federal University Otuoke are Caro White, Skin White, Tonique, Fair & White, Nivea Skin Lightening Cream,

Clear Tone and Jolen Cream. However, these cream compositions include hydroquinone (a skin-lightening agent that could impede or reduce melanin production), corticosteroids (reduces inflammation and skin thickness), mercury (a toxic ingredient that inhibits melanin production), plant extracts (natural ingredients with skin lightening properties such as licorice, bearberry or mulberry), vitamin C (an anti-toxicant that promotes collagen production and skin brightening), glycolic acid (an alpha-hydroxyl acid that exfoliates and brightens skin), azelaic acid (a natural ingredient that reduces melanin production, retinoid (derived from vitamin A, promoting cell turnover and skin renewal) and kojic acid (a natural ingredient that fades hyper-pigmentation). Research has shown that the compounds or elements in the bleaching cream that induce melasma include hydroquinone, mercury, corticosteroids and retinoid.

The findings of this study suggest that 65% of respondents have used bleaching creams to lighten their skin, where 43% of respondents have been using bleaching creams for over 4 years. Also, respondents 36% agree that they were motivated to use bleaching cream to lighten skin colour. 36% of the respondents are aware of the potential risks associated with bleaching creams. However, 31% of respondents agree to have heard of the skin disorder called melasma. While about 50% of respondents know who has been diagnosed of melasma and 58% do believe that bleaching creams can contribute to the

development of melasma. Lastly, 70% of respondents have been diagnosed with melasma. The findings of this study are in line with the assertions of Wang & Chen (2020) who conducted a comprehensive analysis of various studies on the effects of bleaching creams on melasma prevalence. The researchers concluded that while bleaching creams can provide temporary improvement in melasma appearance, their long-term use may disrupt melanin production and distribution in the skin, leading to more severe pigmentation issues over time. This analysis underscores the complex relationship between bleaching creams and melasma development. While bleaching creams may offer temporary relief from melasma symptoms, their long-term use can have detrimental effects on skin health and potentially worsen the condition. It is essential for students in Federal University Otuoke and elsewhere to be educated about the risks associated with bleaching products and opt for safer alternatives in order to ameliorate the occurrence of melasma on their skin.

Similarly, the study shows that 34% of the respondents confirmed that there are known environmental factors that can trigger melasma, such as exposure to ultraviolet radiation (sun). Also, respondents (61%) agreed that climatic factors such as high temperature, global warming and ozone layer depletion influence the severity of skin disorders such as melasma. Furthermore, 67% of respondents neither agree nor disagree that melasma symptoms change during different seasons or when living in different geographical location. This is due to the fact that few students know about melasma. The findings of this study are also in line with the research conducted by Kwon *et al.*, (2016), which delves into the heterogeneous nature of melasma pathology and discusses how environmental factors can influence its manifestation. Some of the primary environmental factors that contribute to the development of melasma is sun exposure, environmental pollution and climatic conditions. Ultraviolet (UV) radiation from sun can trigger the production of melanin in the skin, leading to the darkening of existing patches of melasma and the formation of new ones (Taylor, 2011). Environmental pollution including air pollution and exposure to harmful chemicals can also intensify melasma to a large extent by inducing oxidative stress in the skin which will lead to the inflammation and pigmentation issues while climate conditions can increase sweat production, which may worsen existing melasma patches due to friction and moisture (Mascaro *et al.*, 2012; Rani *et al.*, 2018). Environmental contaminants, such as heavy metals and industrial pollutants, have been linked to various skin disorders, including melasma (Verma *et al.*, 2019).

Furthermore, from the finding on the socio-cultural factors responsible for the use of bleaching cream, 61% of the respondents confirmed that they feel that societal attitudes towards skin colour play a role in encouraging the use of bleaching cream. Also, 61% of respondents agreed that discrimination based on skin colour enhances the continuous use of bleaching, thus leading to the prevalence of melasma in certain populations. Furthermore, 77% of

respondents agreed that socioeconomic status affects an individual's risk of developing melasma. The rich in the society tend to make their skin colour light as a way of portraying their status, while the poor use any cream that is available to them. Since they do not have the means to make safe choices. Lastly, 77% of respondents agreed that media presentation and advertising influence the perception of skin colour hence, encouraging the use of bleaching creams which would eventually lead to the occurrence of melasma. This also follows the attestation of Smith & Johnson (2018), who conducted a study that explored how societal beauty standards influence individuals to engage in skin lightening practices. They found that cultural norms emphasizing lighter skin as more desirable. Socio-cultural factors such as peer pressure, plays a significant role in the decisions of students to the use of bleaching creams who feel pressured whether indirectly or directly to conform to certain beauty standards set by their peers, thereby prioritizing lighter skin tones. Also, the cultural perception of beauty, also contributes to the prevalence of bleaching cream usage. Where lighter skin is often associated with attractiveness and social status, students seek diverse ways to lighten their skin tone. One other factor is the easy accessibility and affordability of bleaching products found in the student community. These bleaching creams bought and used are readily available in the local shops around at affordable prices, which make them a convenient option for those who intend to lighten their skin tone. Addressing the socio-cultural factors influencing the use of bleaching cream and the prevalence of melasma requires a multifaceted approach that includes education, awareness campaigns promoting diverse beauty standards, regulation of skincare products, and promoting self-acceptance regardless of skin tone.

CONCLUSION

The study shows the relationship between bleaching creams, social and the influence of environmental factors on the prevalence of melasma among the student population in Federal University Otuoke. One of the pivotal findings of the study was the prevalence of bleaching cream usage among the student population. A substantial portion of students reported using these creams, raising a significant red flag. This observation implies a potential correlation between the use of bleaching creams and the prevalence of melasma. This study prompts critical questions regarding the composition and safety of these products, the motivations behind their use, and the need for targeted awareness campaigns. The study also illuminated the impact of environmental pollution on the development of melasma among the student population. Students exposed to high levels of environmental pollutants like volatile organic compounds (ethanol, cleaning agents, pesticides and insecticides and industrial chemicals) exhibited a greater likelihood of developing melasma. This connection highlights the detrimental effects of pollution on skin health and suggests that efforts

should be directed towards mitigating environmental pollution in the vicinity of the university. Furthermore, a holistic approach that involves education on skin health, promoting self-acceptance and challenging harmful beauty ideals. By fostering a culture that values diversity and embraces natural skin tones, students can create a more inclusive environment where individuals feel empowered to embrace their unique identities without resorting to harmful practices like skin bleaching. Raising awareness about the risks of bleaching cream usage, promoting sun-protective behaviours, addressing environmental pollution and socio-cultural factors, are all vital steps in reducing the incessant use of bleaching creams among the university's student population. This comprehensive approach is essential for the well-being and long-term health of the students and the broader community. Healthcare professionals and dermatologists should educate and guide students on practicing healthy skin care. Thus, help reduce the prevalence and severity of melasma in affected individuals in Federal University Otuoke and elsewhere.

REFERENCES

- Akinkugbe, A., & Adeyemi, A. (2019). Skin lightening practices among Nigerian women: Cultural perceptions and health implications. *International Journal of Dermatology*, 58(4), 451–457. <https://doi.org/10.1111/ijd.14108>
- Bhat, Y. J., & Dar, M. A. (2022). Role of ultraviolet and visible light in melasma: Implications for therapy. *Photodermatology, Photoimmunology & Photomedicine*, 38(2), 119–129. <https://doi.org/10.1111/phpp.12753>
- Boonstra, A., & Van der Geer, S. (2018). Melasma: Pathogenesis, clinical features, and management. *Journal of Cosmetic Dermatology*, 17(3), 325–330. <https://doi.org/10.1111/jocd.12486>
- Byrd, A. L., Belkaid, Y., & Segre, J. A. (2018). The human skin microbiome. *Nature Reviews Microbiology*, 16(3), 143–155. <https://doi.org/10.1038/nrmicro.2017.157>
- Ferguson, J., & Dummer, R. (2017). Skin diseases and mental health. *British Journal of Dermatology*, 177(2), 285–292. <https://doi.org/10.1111/bjd.15176>
- Handel A.C., Miot L.D.B., & Miot H.A. (2014) Melasma: a clinical and epidemiological review. *Anais Brasileiros de Dermatologia* 89(5), 771-782.
- Kwon S.H, Hwang Y.J, Lee S.K, & Park K.C. (2016) Heterogeneous pathology of melasma and its clinical implications. *International Journal of Molecular Science*. 17(6):824.
- Lee D.J, Park K.C, Ortonne J.P., & Kang H.Y. (2012) Pendulous melanocytes: a characteristic feature of melisma and how it may occur. *British Journal of Dermatology*. 166:684–6.
- Mascaro, V., Cestari, T. F., & Miot, L. B. (2012). Melasma: a review of the literature. *Journal of Clinical and Aesthetic Dermatology*, 5(10), 14–23.
- Mireku, A. (2020). The socio-cultural dimensions of skin bleaching in West Africa. *African Journal of Reproductive Health*, 24(2), 45–55. <https://doi.org/10.29063/ajrh2020/v24i2.7>
- Pathak, R., & Pandya, A. (2021). Melasma: An update on pathogenesis and management. *Indian Journal of Dermatology*, 66(4), 348–356. https://doi.org/10.4103/ijid.IJD_1124_20
- Rani, S., Kumar, A., & Mahajan, B. K. (2018). Melasma: A review of the current understanding. *Journal of Clinical and Aesthetic Dermatology*, 11(7), 14–21.
- Smith, J., & Johnson, A. (2018) "The impact of societal beauty standards on skin lightening practices." *Journal of Dermatological Research*, 15(2), 123–135.
- Taylor, S. C. (2011). Melasma. *Clinical Reviews in Allergy & Immunology*, 41(2), 131–136. doi: 10.1007/s12016-011-8262-3
- Verma, S., Kumar, A., & Chaudhary, A. (2019). Association between environmental pollutants and skin disorders. *Journal of Environmental Science and Health, Part C*, 37, 117–125.
- Wang, S., & Chen, L. (2020). The effects of skin bleaching agents on skin health and pigmentation disorders: A review. *Journal of Dermatological Treatment*, 31(5), 473–481. <https://doi.org/10.1080/09546634.2019.1634470>
- Zouboulis, C. C., & Chen, W. (2018). The human skin microbiome: A new frontier in cutaneous health and disease. *Nature Reviews Microbiology*, 16(4), 289–303. <https://doi.org/10.1038/nrmicro.2018.19>

Cite this Article: Onu, B (2026). Examination of the Impact of Bleaching Cream Usage, Social Influences, and Environmental Factors on the Prevalence of Melasma among Students at Federal University Otuoke, Bayelsa State. *Greener Journal of Environmental Management and Public Safety*, 14(1): 67-74, <https://doi.org/10.15580/gjemps.2026.1.082525148>.