

THE INVERSE RELATIONSHIP BETWEEN AEROPOLLEN AND AEROSPORA UNDER THE SAME METEOROLOGICAL FACTORS IN EBUTE–METTA, LAGOS MAINLAND, LAGOS, NIGERIA

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ABSTRACT

Knowledge of the aeroflora of a particular community is important for guiding hypersensitive individuals regarding their allergic condition. Ebute-Metta, a densely populated area in the Mainland Local Government, was aeropalynologically studied. The aim was to quantify airborne pollen and spores and assess their relationship with meteorological factors in the study area. Monthly aeropalynological sampling was conducted from January to May 2024. Acetolysis was carried out on the collected samples. Microscopic analysis of the acetolysed residues revealed a diverse range of airborne palynomorphs. A total of 494 palynomorphs were counted, representing 21 plant families and 13 genera. The most abundant types belonged to Poaceae, Amaranthaceae, Alchornea cordifolia, Typha sp., Asteraceae, Terminalia catappa, and Dryopteris sp. (pteridophytes). Notably, Poaceae pollen was the dominant type throughout the sampling period, while Drechslera sp. and Nigrospora sp. were the most prevalent airborne fungal spores. While pollen dominated in the dry months of January to March 2024, the fungal elements, along with Pteridophyte spores, dominated during the wet months of April to May 2024. Relative humidity, rainfall, wind speed, and temperature were found to be determining meteorological factors of pollen, spores, and fungal elements in the air of the study area. Notably, spores correlated positively with average rainfall and relative humidity. However, only temperature showed a positive, insignificant correlation with pollen. While wind speed and temperature exhibited a negative, insignificant correlation with spores, only relative humidity showed a negative, insignificant relationship with pollen. Based on the identified airborne particles in the study area, the candidate allergenic particles are Poaceae, Alchornea cordifolia, Typha sp., Terminalia catappa, and Nigrospora sp.

KEY WORDS: Aeropalynology, Allergy, Lagos, Health, Pollen and Spores, Meteorological factors,

INTRODUCTION

Aeropalynology, a specialized field in Botany, deals with the study of airborne pollen and spores suspended in the atmosphere (Wodehouse, 1935; Erdtman, 1969; Adeonipekun, 2015). Over 250,000 plant species are known to produce pollen (Ziello *et al.*, 2012). Some of these pollen grains are airborne and have been implicated in causing various allergy symptoms in people (Akasoro *et al.*, 2025). Grasses are identified as the most common airborne pollen in different parts of the world, including Australia and New Zealand (Harbele *et al.*, 2014), Europe (Kizilipinar *et al.*, 2011; Ziello *et al.*, 2012), India (Singh & Marthur, 2012), Egypt (El-Ghazaly & Fawzy, 1988), and in Nigeria (Adeniyi *et al.*, 2014; Akasoro, 2014; Akasoro & Sowunmi, 2023; Akasoro *et al.*, 2025; Akasoro *et al.*, 2026; Adeonipekun *et al.*, 2016; Ezike *et al.*, 2016). For instance, Catarrh, which has been linked to airborne pollen and spores in Ibadan metropolis, Nigeria, was identified as a major symptom of allergic reactions in susceptible individuals (Akasoro *et al.*, 2025). The concentration, diversity, and abundance of these airborne pollen across different regions of the world are significantly influenced by seasonal flowering patterns and weather conditions such as temperature, rainfall, humidity, and wind speed (Singh & Mathur, 2012; Adeniyi *et al.*, 2014; Adeonipekun *et al.*, 2016; Ibigbami & Adeonipekun, 2020). In Africa, aeropalynological studies have contributed to advances in knowledge of the incidence of allergic reactions. The contributions of Cadman (1991a and 1991b), Cadman & Dames (1993), and Potter & Cadman (1996) on the airspora of Pretoria and Durban, South Africa, cannot be overstated. While grasses dominated the recovery in Pretoria (Cadman, 1991b), the species recovered in Durban did not reflect the local vegetation (Cadman & Dames, 1993). Cape Town (Hawke and Meadows, 1989) and Johannesburg (Cadman, 1991a) studies revealed that the airspora mainly comprises *Morus* spp., *Cannabis* spp., Poaceae, *Celtis* spp., *Cynodon* spp., Asteraceae, *Pinus* spp., and Fabaceae. In their publication of a pollen calendar for Egypt, Eastern Africa, El-Ghazaly & Fawzy (1988) found Poaceae, *Casuarina* spp., *Urtica* spp., *Cupressus* spp., Amaranthaceae, Brassicaceae, Fabaceae, *Pinus* spp., Rosaceae, and Asteraceae to be dominant. While studying the distribution of Poaceae in the air of Tetouan in northwestern Morocco, Aboulaich *et al.* (2012) ascertained a negative correlation between pollen and meteorological parameters, particularly relative humidity and rainfall. In Nigeria, Njokuocha (2006) examined airborne pollen sampling at two heights (1.8 m and 15 m) in Nsukka, Anambra State. He discovered differences in the recoveries at different heights. The analysis also revealed that the airborne pollen and spores observed at 15 m height were significantly higher than those recorded at 1.8 m. Pollen from Poaceae, Asteraceae, Mimosaceae,

Elaeis guineensis Jacq. (Arecaceae), and *Alchornea cordifolia* (Schumach. & Thonn.) Müll.Arg., were found to dominate the recovery recorded by Adekanmbi and Ogundipe (2010) from the University of Lagos campus. They found aeropollen to be higher in May and lower in February. Adeonipekun and John (2011) analysis of the biological contents of the March 2010 hazy dust in Ayetoro, Southwest Nigeria, revealed the presence of savanna and derived savanna pollen grains, in contrast to Ayetoro, which had a secondary forest vegetation type. Pollen of *Vitex* cf. *doniana* Sweet. dominated the palynoflora along with *Isoberlinia doka* Craib & Stapf. The aeroflora content suggested north-eastern Nigeria as the source of the hazy dust. Adeonipekun (2012) further compared these results by sampling the same area in Southwest Nigeria in March 2011. The result revealed a predominance of Poaceae and Amaranthaceae in the aeroflora. There was no record of *Vitex* cf. *doniana* and *Isoberlinia doka* in the previous year. His findings further supported the conclusion of Adeonipekun and John (2011) that the Haze dust of March 2010 resulted from the late harmattan triggered by an unknown event that brought savanna pollen, which dominated the previous data. Adeniyi *et al.* (2014) also investigated the incidence of airborne pollen in three highly populated locations in Shomolu, Lagos State: University of Lagos, Bariga, and Gbagada. The main taxa found include Poaceae, Cyperaceae, Amaranthaceae, *Casuarina equisetifolia* L., and *Alchornea cordifolia*. They reported that the total pollen concentration correlated positively with temperature and negatively with wind, rainfall, and relative humidity. They were the first to report correlations between airborne pollen and meteorological parameters in Nigeria and generated the first pollen calendar. Ajikah *et al.* (2015) reported that Poaceae, Cyperaceae, Mimosaceae, *Elaeis guineensis*, and *Alchornea cordifolia* were the dominant pollen in their aeropalynological study on the University of Lagos campus. Adeonipekun *et al.* (2016) found pollen of Poaceae, *Alchornea cordifolia*, *Elaeis guineensis*, *Typha* spp., *Cleome* spp., *Ocimum gratissimum*, Arecaceae, Amaranthaceae, and Combretaceae/Melastomataceae dominating the flora in a one-year aeroflora survey of Ayetoro area in southwest Nigeria. Pteridophyte spores recovered included *Dryopteris* sp. *Acrostichum aureum*, *Polypodium* spp., *Nephrolepis* spp., and *Pteris* spp. The aeroflora compositions were more abundant during the dry months (March and November). Ezike *et al.* (2016) recovered pollen of *Pentaclethra macrophylla*, Poaceae, *Elaeis guineensis*, and *Justicia* spp. in their aeropalynological study of Garki, Abuja, the Federal Capital Territory of Nigeria. They reported that total pollen counts did not show a significant correlation with meteorological parameters. The health implications of airborne pollen grains and spores in hypersensitive and susceptible people were evaluated by Akasoro *et al.* (2025), who combined

sociodemographic data with aeropalynology. The study linked the presence of airborne pollen and spores to the prevalence of allergic reactions among the populace in Ibadan, especially during the dry/ harmattan season. Akasoro *et al.* (2026) studied airborne pollen and spores on the University of Ibadan campus during the dry/harmattan period from November to February, which revealed abundant recovery of airborne pollen grains and lower fungal spores. These aeropalynomorphs are potential aeroallergens in Ibadan metropolis, causing allergic rhinitis in people (Akasoro *et al.*, 2025, 2026). Despite previous studies, aeropalynology in Nigeria still faces some challenges (Adeonipekun, 2015; Akasoro, 2015). As listed by Adeonipekun (2015) and Akasoro (2015), some of these challenges include the size and non-uniformity of standardized pollen samplers, inadequate and irregular electricity supply, and the high diversity of tropical plants in the region.

The objective of this study was to investigate the concentrations and relationships between airborne pollen and spores, and meteorological data in Ebute-Metta, Lagos, Nigeria.

MATERIAL AND METHOD

Study Area. Ebute–Metta (Three Harbours) is a populated neighbourhood within the Lagos Mainland Local Government Area (LGA) with 317,980 inhabitants in Lagos State, Southwest Nigeria. It borders Yaba, Lagos Mainland, Lagos Lagoon, and the Nigerian Railway Corporation to the North, East, South, and West of Lagos, Nigeria, respectively. It is a megacity with over 21 million inhabitants (Worldometer, 2023). Ebute-Metta is located at latitude 6°29'16"N and longitude 3°22'54"E, with a tropical climate that has distinct wet and dry seasons (Fig. 1). Though Southwest Nigeria boasts of a variety of vegetation zones - tropical rainforest, Guinea savanna, and mangrove swamp- Ebute–Metta has lost most of its natural cover due to urbanization. However, ornamental plants and weeds have become more prominent. Herbs like *Alchornea* sp. are common, along with trees such as coconut (*Cocos nucifera*), oil palm (*Elaeis guineensis*), mango (*Mangifera indica*), Indian almond (*Terminalia cattapa*), and some grasses cover a range of land areas. Beyond its residential areas, Ebute–Metta offers residents an ultra-modern hospital, ultra-modern markets, and a wide selection of housing estates.

Sample Location. Aeropalynological samples were collected for five months from Ebute-Metta, from January to May 2024, using a gravitational aerosampler (*Gbenga* 2) (Adeonipekun, 2012). A mixture of formaldehyde and glycerol was used as the medium in the aerosampler, which was placed on a 2m high stand.

Sample Preparation, Microscopic Analysis, and Identification of Palynomorphs. The residues recovered from the aerosampler were acetolyzed with Tetraoxosulphate(vi) acid (H_2SO_4) and Acetic anhydride in a 9:1 ratio (Erdtman 1969). The acetolysis was poured into each residue, heated in a water bath at 80 °C for 5 minutes, and allowed to cool. The residue was washed and decanted after centrifuging three times. The residues were stored in a vial with two drops of glycerine (Adeonipekun and John, 2011).

Twenty microliters of the residue were mounted on a slide and then gently covered with a coverslip. It was sealed with nail polish. The slide was palynologically analysed under the microscope. Palynomorphs found were identified, counted, and recorded. The identification of pollen and spores was done through the use of published pollen atlases such as Sowunmi (1973, 1995), Adeonipekun (2012), and Gosling (2013), as well as reference collections in the Laboratory of Paleobotany and Palynology, Department of Botany, Faculty of Life Sciences, University of Lagos, Lagos, Nigeria.

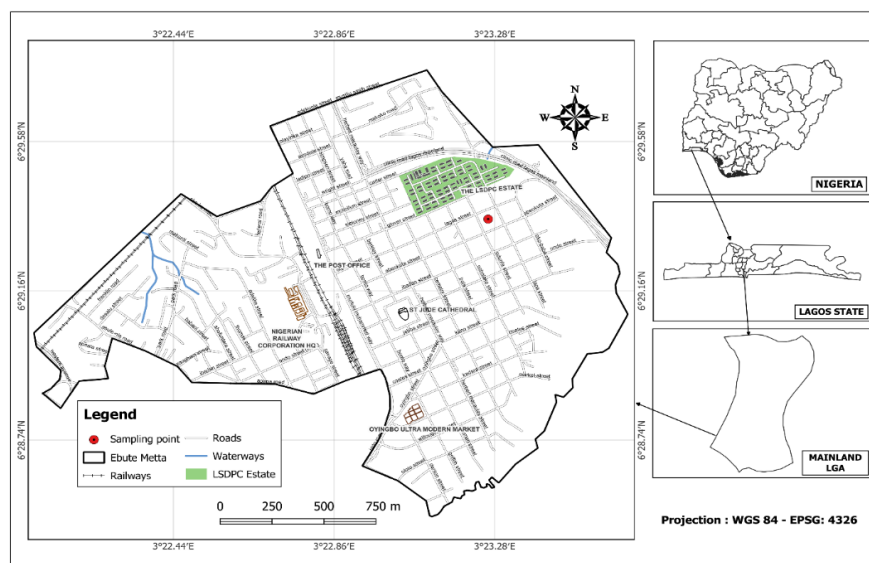


FIG 1: Location map showing the sampling site in (red circle) in Ebute-Metta

Meteorological Data Collection and Statistical Computation. The meteorological data for the location from January to May 2024 were collected from the

Nigerian Meteorological Agency (NiMeT), Lagos, Nigeria. The parameters considered in the data were average rainfall, air temperature, wind speed, and relative humidity for the study area (Tab.3). These were correlated with pollen and spore counts using the Pearson Correlation coefficient at 95% confidence interval to show the statistical significance in the data.

RESULTS AND DISCUSSIONS

The analysis of the aerosamples collected revealed a diversity of palynomorphs during the study period. A total of 494 palynomorphs were counted and recorded, representing 21 plant families (Tab.1). Pollen and spore concentrations exhibited monthly variations throughout the sampling period (Tab. 1). Pollen grains of *Alchornea cordifolia* were the dominant species in January, while *Terminalia catappa* had the highest abundance in February. Amaranthaceae was abundant in March, with *Typha* sp. having the highest recovery in April and May. The pollen with the lowest count in January was Malvaceae and cf. *Mimosa*, February (*Typha* sp.), March (Bombacaceae, cf. Cyperaceae, and Tricolporate), April (Fabaceae), and May (*Causarina* sp. and Euphorbiaceae). (Tab.1)

The highest pollen counts occurred in January, while the lowest concentration was observed in May (Tab. 2). This pattern appears to follow a seasonal trend, with wet months (April – May) recording lower pollen values but higher spore values, and vice versa for the dry months (January – March).

The analysis revealed Poaceae as the most dominant family, contributing 17.80% of the total pollen concentration (Table 2). Combretaceae and Euphorbiaceae, respectively, follow the trend with 17.02% and 15.71% of the collected pollen (Figure 2). Other significant pollen types were *Alchornea cordifolia*, *Terminalia catappa*, and *Typha* sp.. Conversely, the highest spore counts occurred in April, with lower counts recorded in January.

The highest Pteridophyte spore was *Dryopteris* sp., while cf. *Polypodium* sp. was the least. Surprisingly, *Nigrospora* sp. predominated over other spores throughout the sampling period, being the most abundant fungal spore, while *Glomus* sp. and *Pithomyces* sp. were the least abundant. Diatom frustules of *Aulacoseira* sp. were also observed once in May (Figure 2).

The meteorological parameters indicated that the temperature gradient remained constant in January and February, but increased slightly in March (Table 3). However, there was a sharp decrease in April and May. Conversely, average rainfall was found to increase and decrease during the months of study. The highest rainfall was in May, with

291.5mm, followed by April and February, with lower values for January. This fluctuation in monthly rainfall had a significant impact on the relative humidity for the months of study, with the same trend. The highest wind speed was recorded for February, while January had the lowest value (Table 3).

TABLE 1: Total abundance and Percentage composition of Pollen and Spores

POLLEN	FAMILY	January	February	March	April	May	Total	Composition
<i>Alchornea cordifolia</i>	Euphorbiaceae	28	10	6	8	0	52	10.526
<i>Alternanthera sp.</i>	Amaranthaceae	6	0	0	0	0	6	1.215
Amaranthaceae	Amaranthaceae	0	9	16	0	0	25	5.061
Asteraceae	Asteraceae	22	0	0	0	0	22	4.453
Bombacaceae	Bombacaceae	0	0	2	0	0	2	0.405
<i>Cassia sp.</i>	Caesalpinaceae	8	0	0	0	0	8	1.619
<i>Casuarina sp.</i>	Casuarinaceae	0	0	0	0	2	2	0.405
<i>Cf. Citrus</i>	Rutaceae	0	0	3	0	0	3	0.607
<i>Cf. Cyperaceae</i>	Cyperaceae	0	0	2	0	0	2	0.405
<i>Cf. Mimosa sp.</i>	Fabaceae	2	0	0	0	0	2	0.405
<i>Chromola odorata</i>	Asteraceae	4	0	0	0	0	4	0.81
Combretaceae	Combretaceae	5	0	0	12	8	25	5.061
<i>Delonix regia</i>	Fabaceae	0	0	5	0	3	8	1.619
<i>Elaeis guineensis</i>	Arecaceae	11	0	5	3	0	19	3.846
Euphorbiaceae	Euphorbiaceae	0	0	6	0	2	8	1.619
Indeterminate		0	2	0	5	3	10	2.024
Lamiaceae	Lamiaceae	0	0	0	0	1	1	0.202
Malvaceae	Malvaceae	2	0	0	0	0	2	0.405
Arecaceae	Arecaceae	0	0	4	0	0	4	0.81
Fabaceae	Fabaceae	0	0	0	2	0	2	0.405
Poaceae	Poaceae	18	12	15	13	10	68	13.765
<i>Raphia hookeri</i>	Arecaceae	1	0	0	7	3	11	2.227
Reti-tricolporate		0	0	0	1	0	1	0.202
<i>Terminalia catappa</i>	Combretaceae	0	36	4	0	0	40	8.097
Tricolporate		0	0	2	0	0	2	0.405
<i>Tridax procumbense</i>	Asteraceae	9	0	0	0	0	9	1.822
Triporate		0	0	0	0	1	1	0.202
<i>Typha sp.</i>	Typhaceae	0	2	4	22	29	57	11.538
		116	71	74	73	62	396	
PTERIDOPHYTES SPORE	FAMILY	January	February	March	April	May	Total	
<i>Dryopteris sp.</i>	Dryopteridaceae	0	2	1	5	3	11	2.227
Trilete Spore		3	0	3	0	0	6	1.215
<i>Cf. Polypodium</i>	Polypodiaceae	0	0	0	2	0	2	0.405
		3	2	4	7	3	19	
FUNGAL SPORE	FAMILY	January	February	March	April	May	Total	
<i>Glomus sp.</i>	Glomeraceae	0	0	0	0	6	6	1.215
<i>Curvularia sp.</i>	Pleosporaceae	0	1	1	4	6	12	2.429
<i>Nigrospora sp.</i>	Apiosporaceae	4	2	3	9	5	23	4.657
<i>Drechslera sp.</i>	Pleosporaceae	0	3	5	3	5	16	3.239
Fungal Spores		2	3	1	5	4	15	3.036
<i>Pithomyces sp.</i>	Pleosporaceae	0	0	2	4	0	6	1.215
		6	9	12	25	26	78	
DIATOM	FAMILY	January	February	March	April	May	Total	
<i>Aulacoseira sp.</i>	Aulacoseiraceae	0	0	0	1	0	1	0.202
TOTAL							494	100

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TABLE 2: Total Monthly Pollen Concentration Trends

Month	Pollen Count	Pollen Concentration (%)
January	116	29.292
February	71	17.93
March	74	18.687
April	73	18.434
May	62	15.657
TOTAL	396	100

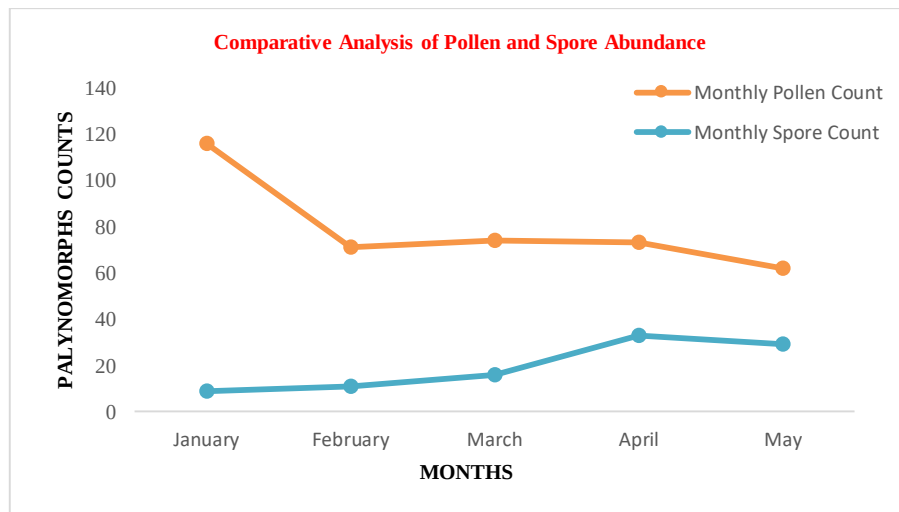


FIG 2: Graphical Representation showing comparative analysis of Pollen and Spore recovered through the sampling period.

TABLE 3: Meteorological Data obtained from the Nigerian Meteorological Agency (NIMET), Lagos

Month	Temp (°c)	Av Rainfall(mm)	Relative Humidity(%)	Wind Speed(km/hr)
January	30.3	5.6	76	2.5
February	30.3	105.3	74	3.9
March	30.5	72.1	81	3.2
April	30.45	129.2	80	3.1
May	29.4	291.5	83	2.8

TABLE 4. Pearson Correlation coefficient(r) between Total Pollen and Spores' Concentration and Meteorological parameters

Pearson Correlation t(r)	Temperature. (°c)	Average Rainfall (mm)	Relative Humidity (%)	Wind Speed (km/hr)
Pollen	0.3411	-0.7636	-0.4953	-0.5420
Spores	-0.3281	0.7073	0.7412	-0.1632

(P < 0.05)

Report of statistical analysis using the Pearson correlation coefficient at a 0.05 significance level (Table 4) revealed the following:

Pollen-Meteorology Relationship. Pollen showed a positive correlation with temperature ($r = 0.3411$), meaning that as temperature increased, pollen counts tended to rise. Conversely, pollen showed a negative correlation with average rainfall ($r = -0.7636$), relative humidity ($r = -0.4953$), and wind speed ($r = -0.5420$). Of these, the correlations with rainfall and wind speed were statistically significant, while those with temperature and relative humidity were not (Table 4).

Spore-Meteorology Relationship. Spores exhibited positive correlation with average rainfall ($r = 0.7073$) and relative humidity ($r = 0.7412$), with both relationships being statistically significant. Spore concentrations had a negative correlation with both temperature ($r = -0.3281$) and wind speed ($r = -0.1632$), though these relationships were not statistically significant. The month with the highest level of pollen abundance was January, while the lowest counts were in May. Conversely, the highest and lowest spore counts were recorded for April and January, respectively.

A remarkable recovery was recorded in the air of Ebute-Metta, Lagos, for each month during the study period. In the study, Poaceae was found to be the most abundant family in the recovery, as reported in previous works at the same location (Adeniyi *et al.*, 2018) and elsewhere (Adeniyi *et al.*, 2014; Adeonipekun *et al.*, 2016; Ezike *et al.*, 2016). The first report on the presence of Poaceae in the air of Ebute-Metta was made by Adeniyi *et al.* (2018), though in low quantities. Adeniyi *et al.* (2018) suggested that Ebute-Metta was a haven for those susceptible to Poaceae pollen allergy due to low occurrence in their recovery. However, a decade after their recovery was made in 2014, there was a change over time in the pattern of Poaceae abundance in the air of Ebute-Metta. This may be linked to weather factors and human activities, occasioned by changes in the lifestyles of Ebute-Metta inhabitants over a decade. A cursory look at the meteorological parameters of Ebute-Metta over a period of ten (10) years from 2014 to 2024 shows remarkable differences in the data obtained from NiMet. For instance, from January to May, 2014, the average temperature was 28°C while it was 30.3°C in the same months in 2024. Interestingly, the intensity of the heat has increased by 2.3 °C over the past 10 years. Despite this increase in heat intensity, however, pollen still correlated positively with temperature and negatively with other parameters in consonance with the reported case by Adeniyi *et al.* (2018). Ibigbami and Adeonipekun (2020) also reported similar results, with Poaceae being the most abundant pollen in Ikeja and Ipaja. Poaceae exhibited peak occurrence in January and minimal occurrence in May. The persistence of Poaceae pollen is likely due to the variety of grasses that flower at various

times throughout the year (Kasprzyk & Walanus, 2010). Additionally, maize, a notable Poaceae, is cultivated during the wet season. Hence, it contributed significantly to the counts in the wet April–May period.

Poaceae is a common trigger for allergic hay fever (allergic rhinitis) worldwide (D'Amato *et al.*, 2007; Adeniyi *et al.*, 2014, 2017, 2018; Garcia-Mazo, 2017, Akasoro *et al.*, 2025, 2026). Unlike some other allergens, grass pollen releases its antigens very quickly upon contact with the mouth, nose, or eyes (D'Amato *et al.*, 2007). This may be due to its fragile morphology, especially the aperture through which pollen content is released. The amount of grass pollen in the air directly affects the severity of symptoms in susceptible people with allergies (Akasoro *et al.*, 2025). Studies in London have shown that even relatively low concentrations of grass pollen, as low as 10-50 grains per cubic meter of air, can trigger hay fever symptoms in sensitive individuals (D'Amato *et al.*, 2007).

Alchornea cordifolia, a wind-pollinated plant that lacks a noticeable fragrance, was also recorded in abundance in this study, similar to the recovery recorded in Ikeja and Ipaja, Lagos (Ibigbami & Adeonipekun, 2020), as well as in Ibadan (Akasoro *et al.*, 2025, 2026). Its allergenicity, notoriety, ubiquity, and copious pollen production have been established, with its dominance in aeropalynological studies in Nigeria (Adeniyi *et al.*, 2017, 2018). Amaranthaceae pollen exhibited a monthly pattern, with abundance observed in March, which also agrees with the report by Adeonipekun *et al.* (2016) in Ayetoro-Itele, Ogun State, in March 2011. However, the peak periods of Amaranthaceae pollen in the air may vary by location. This can be due to the influence of local meteorological patterns and the vegetation composition of the location. *Typha* sp. pollen was rare in January, but highest abundance in May.

This study revealed a significant rise in *Terminalia catappa* pollen in February. This abundance was followed by a rapid decline in March, ultimately leading to its disappearance. The clustered nature of the clumping grains in the February samples suggests the pollen likely traveled a short distance. Asteraceae pollen was abundant in January. Previous researchers throughout Nigeria consistently found Asteraceae pollen to be a prevalent airborne component (Adekanmbi & Ogundipe, 2010; Adeniyi *et al.*, 2014, 2018; Alebiosu *et al.*, 2018; Akasoro *et al.*, 2025, 2026). The pollen of *Elaeis guineensis* had the highest count in January but declined throughout the remaining months during the sampling period. Ajikah *et al.* (2015) identified it among pollen types at the University of Lagos, Akoka, Nigeria. Surprisingly, there was no record of its recovery in Ikeja and Ipaja (Ibigbami & Adeonipekun, 2020). Bombacaceae, *Casuarina*

sp., Malvaceae, and Fabaceae pollen were observed twice throughout the sampling period, while pollen from Lamiaceae had the fewest occurrences in the study.

Dryopteris spores dominated throughout the sampling period, aligning with the findings of Adeonipekun *et al.* (2016). Ibigbami and Adeonipekun (2020) reported *Dryopteris* dominance in Ikeja. Remarkably, *Nigrospora*, *Curvularia*, *Drechslera*, and *Pithomyces* were also observed during the sampling period. Consistent with this study, fungal spores were more prevalent during wet months in Nigeria (Ezikanyi *et al.*, 2018; Ibigbami & Adeonipekun, 2020). This is likely due to conditions favoring fungal growth during the rainy season. *Nigrospora* sp. was the most abundant spore throughout the sampling period. Ezikanyi *et al.* (2018) and Ibigbami and Adeonipekun (2020) also reported *Nigrospora* sp. in their studies. While primarily known for causing maize ear rot disease (Gxasheka *et al.*, 2015), *Nigrospora* species can also trigger allergic reactions in people with respiratory allergies (Ezikanyi *et al.*, 2018). Interestingly, some studies suggest *Nigrospora* can even cause eye and skin infections in humans under certain circumstances (Ananya *et al.*, 2014). Studies have identified *Curvularia* sp. as a prominent fungal species in both northern and southern regions of Nigeria (Ezikanyi *et al.*, 2018). Additionally, Ajikah *et al.* (2015) reported its recovery from the University of Lagos, Akoka. Spores of *Curvularia* sp. have been linked to allergic sinusitis and respiratory problems (Escuredo *et al.*, 2011).

The fungal spores identified in this study, including *Drechslera* sp., *Nigrospora* sp., and *Curvularia* sp., can pose various health risks. Additionally, these spores can act as effective carriers of allergens, potentially triggering severe asthma attacks (Cahsel *et al.*, 2004). The sudden appearance of *Glomus* spores in May, coinciding with the wet season and high relative humidity according to meteorological data, suggests these conditions favor their growth.

In the five-month aeropalynological study, pollen counts increased significantly during the dry months (January to March), while during the rainy months, fungal spores dominated (April and May). Amaranthaceae, *Alchornea cordifolia*, *Elaeis guineensis*, *Typha* sp., and *Dryopteris* fern spores that are allergenic (Adeniyi *et al.*, 2018; Adeonipekun *et al.*, 2016) are recorded in this study, including dominant members of Poaceae (Adeniyi *et al.*, 2018). Fungal spores are another major contributor to allergies, and their prevalence worldwide has been well-documented in aeropalynological studies (Essien *et al.*, 2013). These spores often constitute a significant portion of airborne particles captured in such studies. This widespread presence highlights the importance of awareness for individuals with allergies to fungal spores. Statistically, the potential candidate pollen and spore allergens are Poaceae, *Typha* sp., *Alchornea cordifolia*,

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Terminalia catappa, *Amaranthaceae*, *Chromolena odorata*, *Combretaceae*, *Elaeis guineensis*, *Dryopteris* sp., *Nigrospora* sp., and *Drechslera* sp.

CONCLUSIONS

This aeropalynological study revealed a clear relationship between atmospheric conditions and the distribution of pollen and spores in Ebute-Metta, Lagos. Temperature increased over the course of ten years in Ebute-Metta, with significant effects on the abundance of Poaceae in the area, in sharp contrast to what was obtainable a decade ago. Changes in weather parameters, as well as the life patterns of inhabitants of Ebute-Metta, caused the inverse relationship between the occurrence of pollen and spores across the months. Significantly, spores positively correlated with average rainfall and relative humidity. However, wind speed and temperature showed an insignificant correlation with spores. Conversely, only temperature had a positive, insignificant correlation with pollen. The pattern of pollen correlation with relative humidity showed a negative, insignificant relationship with wind and average rainfall.

The seasonal trend, meteorological influence, decadal shift, health, and environmental significance are the hallmarks of this study. The study provides valuable data for public health professionals and researchers to develop monitoring systems and preventive strategies for allergic conditions. To protect our health and environment, monitoring pollen levels and avoiding exposure during peak allergy seasons is key. This study will also be useful to public health researchers and professionals in monitoring and developing adequate safety measures, health, and environmental sustainability in Ebute–Metta, Lagos.

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