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Incidence and Prevalence of Left handedness in a Nigerian sub-population

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Abstract

Left handedness is controlled by both genetic and environmental factors. Its occurrence has some advantages in the society. There is usually low prevalence of left handedness and variations exist in its frequency from different populations. The present survey is designed to examine the incidence and prevalence of left handedness among different age groups in two geopolitical zones in Nigeria. This study also presents information on difference in incidence between male and female Nigerians sub-population examined. We determine to extend current knowledge on how Nigerians sub-population varies genetically with regards to distribution of left-handedness alleles. A total of 2704 individuals participated in the survey and they include 450 families of which 250 were recruited from Kwara, North-central and 200 from Lagos South-west Nigeria participated in this study. Statistical Package Social Sciences software (SPSS) Version 16 was used to analyse data the overall incidence of left handedness in the two geopolitical zones studied was 12.2%. The incidence of left handedness in Lagos (20.1%) was almost four times higher than what was recorded in Kwara state (5.4%). In Kwara, incidence of left handedness in males (5.8%) was significantly higher than that of females (4.7%) (χ^2= 0.706, df= 1 p= 0.401). Similar statistically significant findings was observed in Lagos where incidence of 21.9% and 18.4% were recorded for male and female respectively (χ^2=2.32, df= 1 p= 0.128). The findings from this study provide information on left handedness in two geopolitical zones in Nigeria. It will be useful to population geneticists and anthropologists with respect to population studies.

Key words: left handedness, incidence, sub-population, prevalence.

1. Introduction

There is usually variation in anthropological traits, hand preference is no exception. Athwart all human cultures and races left-handedness is found in 5% to 25.9% of individuals and it is usually common in men than in women (Mckeever, 2000; Raymond *et al.*, 1996).

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The rare occurrence of left-handers is most-likely justified by the existence of survival costs, due to the fact that it had been related to a lower birth weight and a higher susceptibility to accidents and some diseases (Llaurens *et al.,* 2009). Despite all these, left-handers persist in human populations since at least the prehistoric period (Faurie *et al.,* 2005). Rationale in variation observed in different culture and region as shown by (Mckeever, 2000; Raymond *et al.,* 1996; Perelle and Ehrman, 2005; Peters *et al.,* 2006] needs to be elucidated. It has been reported that hand penchant is a transmissible feature (Medland *et al.,* 2009) with a little heritability rate ranging from 0.23 to 0.66 (Llaurens *et al.,* 2009).

Frank *et al.,* (2007) reported first potential genetic influence of LRRTM1 (Leucine Rich Repeat Transmembrane Neuronal 1), a candidate gene located on human chromosome 2p12. LRRTM1 was reported to be a maternally suppressed gene associated with handedness and schizophrenia. This discovery by Frank *et al.* (2007) seems to be the beginning of advances in the genetics of handedness, although further work is still going on to understand the mechanism through which this gene directly influences handedness. Recent report from research carried out has suggested that left handedness has considerable influence on some psychological and biological traits in human (Ruebeck *et al.,* 2007). Thus, there may be some generalized advantages of left-handedness in human populations. Studies from Western countries and Uzbekistan showed a higher trend of economic status of lefthanders (Ruebeck *et al.,* 2007; Faurie *et al.,* 2008; Faurie *et al.,* 2011).

In addition, Raymond *et al.* (1996) and Faurie *et al.* (2005) reported another frequency-dependent advantage of left-handers in sports where two players confront each other. Gursoy (2009) reported that left-handedness denotes success, notably in boxing. Reubeck *et al.* (2007) also observed that left-handed college educated people earn 15% more than right-handed college educated people. Findings from Loffing *et al.* (2010) support the assumption that left-handers might enjoy a strategic advantage in tennis. To buttress all these assumptions; out of the seven most recent U.S. Presidents, four, including Barack Obama, have been left-handed. Lastly, Eligar (2011) and Ghayas and Adil (2007) in their studies conducted independently, concluded that the left-handers are more intelligent than the right handers.

Although there may be genetic influences on handedness (Anneken *et al.,* 2004; Sommer *et al.,* 2002), the existence of monozygotic twins with conflicting handedness (Sommer *et al.,*

2002; McManus, 1980) suggests that there might be some possibilities for environmentally induced flexibility (Schaafsma *et al.,* 2009). Many studies have been done on incidence and prevalence of left handedness in Nigeria. Oremosu *et al*. (2011a) worked on the prevalence of left-handedness among medical and dental students of the University of Lagos-Nigeria, they found that males are more left handed and that left handedness decreases with age. Oremosu *et al.* (2011b) also showed left handed students are more talented than right handed students in music, chess, drawing and painting. Eze *et al.* (2009) studied the patterns of handedness and socio-cultural influences on dextrality amongst University of Nigeria medical students and reported that forced dextrality was partly responsible for the higher prevalence of left-handers in male than the female students. Onwuekwe *et al.* (2006) reviewed the relationship between handedness and stroke in Enugu, South east Nigeria. Studies on causes and problems associated with left-handedness among medical and non-medical students at the University of Ilorin were carried out by (Adeoye and Dada, 2004) and they also suggested that left handedness is a genetically-controlled trait.

Most studies carried out on handedness in Nigeria used university students (Oremosu *et al.,* 2011a; Oremosu *et al.,* 2011b; Eze *et al.,* 2009; Onwuekwe *et al.,* 2006; Adeoye and Dada, 2004). To the best of our knowledge, there is limited or no information on left handedness among families and age groups between 5 and above 40. There is therefore, the need to investigate its allelic distribution in different geopolitical zones of Nigeria. This information will be useful in genetic and anthropological studies. The present survey is therefore designed to study the incidence and prevalence of left handedness in ages between 5 and above 40 among families in two geopolitical zones in Nigeria.

2. Materials and Methods

This survey was carried out from among families in Ilorin, Kwara and Isolo, Lagos states of Nigeria. The incidence and mode of distribution of left handedness was determined by screening 250 families involving 1450 individuals (Male 901; Female 549) from Kwara states and 200 families involving 1254 individuals (Male 603; Female 651) from Lagos state.

A personal interview and demonstration was conducted to confirm whether they really exhibit the trait or not. Every family screened for left handedness was asked to demonstrate twice or more in order to ensure that error of clarification and extrapolation were clearly

avoided and to distinguish ambidextrous. Children below age 5 were excluded basically because they might not get the performance right. Individuals who are detected ambidextrous were left out of the study. The questionnaire sought age, sex, ethnic group, information on their socio-demographic characteristics and hand preference for different activities. This was done in the form of a self-group, administered questionnaire which was distributed to them in their home. Names were not required to be written on the questionnaire to ensure confidentiality and to prevent likely bias in their response to the questions.

We categorised a left hander as an individual who can show the ability to write on paper with left, do some elementary job like sweeping, eating, washing, throwing a ball or catching it. The rationale behind this classification or grouping is the fact that it allows a perfect understanding and basis for this two grouping.

Statistical Analysis: Questionnaires were coded and statistical analysis was done using Statistical Package Social Sciences software (SPSS) Version 16 to calculate frequencies and chi-square analysis to test for associations between categorical variables.

3. Results and Discussion

This study was conducted in Kwara and Lagos representing North Central and South West geopolitical zones in Nigeria. Table 1 presents the results of incidence and occurrence of left handedness in relation to right handedness in Kwara state, North Central Nigeria. Overall frequencies of left handedness and right handedness were 0.0537 (5.4%) and 0.9462 (94.6%), respectively. According to Table 1, the highest percentage of participants who were left-handed in this survey were males with 52(5.8%) being left handed and 849(94.2%) right handed; while only 26(4.7%) of the females were left-handed and the highest percentage of right handedness were females at 523(95.3%). Our observation that more males were left handedness than females is statistically significant ($\chi^2 = 0.706$, df= 1, P = 0.401).

It was observed that out of 1450 individuals involving 250 families screened for this trait in Kwara state, prevalence of left-handedness range from 4.5% to 6.9%, the least prevalence of left-handedness (4.5%) was observed in the age group 31-40 while the highest (6.9%) was observed in the age group of 40 and above. Incidence of right handedness ranges from 93.1% to 95.5% in which the least and highest was recorded in age group 40 and 31-40 respectively.

Table 1: Incidence of left handedness in different sexes in Kwara state.

Sex	Left handedness (%)	Right handedness (%)	Total
Male	52(5.8)	849(94.2)	901
Female	26(4.7)	523(95.3)	549
Total	78(5.4)	1372(94.6)	1450

χ^2= 0.706, df = 1, P = 0.401. Parentheses=percentages (%).

Table 1 presents the results of incidence and occurrence of left handedness in relation to right handedness in Lagos state, South West, Nigeria. Overall frequencies of left handedness and right handedness were 252(20.1%) and 1002(79.9%), respectively. According to Table 2 the highest percentage of participants who exhibited left-handedness in this survey were males with 132(21.9%) being left handed and 471(78.1%) right handed; while only 120(18.4%) of the females were left-handed and 531 (81.6%) of female were right handed. Our observation that more males were left handedness than females is statistically significant (x^2 = 2.32, df= 1, P = 0.128).

It was observed that out of 1254 individuals involving 200 families screened for this trait in Lagos state, prevalence of left-handedness ranges from 14.5% to 29.1%, the least prevalence of left-handedness (14.5%) was observed in the age group 31-40 while the highest 67(29.1%) was observed in the age group between 21 and 30. Incidence of right handedness ranges from 93.1% to 95.5% in which the least and highest was recorded in age group 40 and 31-40 respectively.

Table 2: Incidence of left handedness in different sexes in Lagos state

Sex	Left handedness (%)	Right handedness (%)	Total
Male	132(21.9)	849(78.1)	603
Female	120(18.4)	531(81.6)	651
Total	252(20.1)	1002(79.9)	1254

x^2 = 2.32, df = 1, P = 0.128. Parentheses = percentages (%).

Overall, 450 families with 2704 individuals of ages from 5 to above 40 participated in the study from June to September 2009. A total of 1504 males comprising of 901 and 603 from Kwara and Lagos respectively while 1200 females participated in which 549 and 651 were from Kwara and Lagos respectively. Incidence of left handedness in Lagos 20.1% was higher than 5.4% obtained in Kwara state. The highest incidence of left handedness (29.1%) occurred in Lagos among the resident within the age group 21-30, while the lowest value of 4.5% was recorded in Kwara state among participants that are between 31 and 40 years old (Figure 1).

Figure 2 shows the overall incidence in the two geopolitical zones for males and females were 6.8% and 5.4% respectively, while 5.8% and 4.7% was recorded for males and females respectively in Kwara. The incidence among male and female obtained in Lagos was 21.9% and 18.4% respectively. This shows that more left handedness are recorded among males and females in Lagos (21.9% and 18.4%) when compared to Kwara (5.8% and 4.7%). Generally, it was observed that left handedness is prevalent in male than in females (Figure 2).

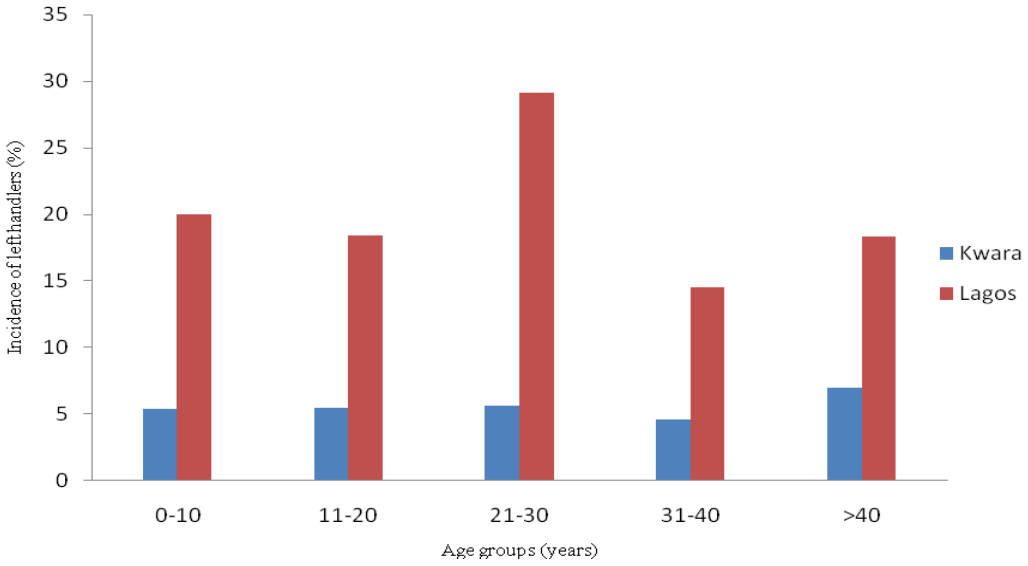

Figure 1: Incidence of left handedness in Kwara and Lagos analysed by difference in age group.

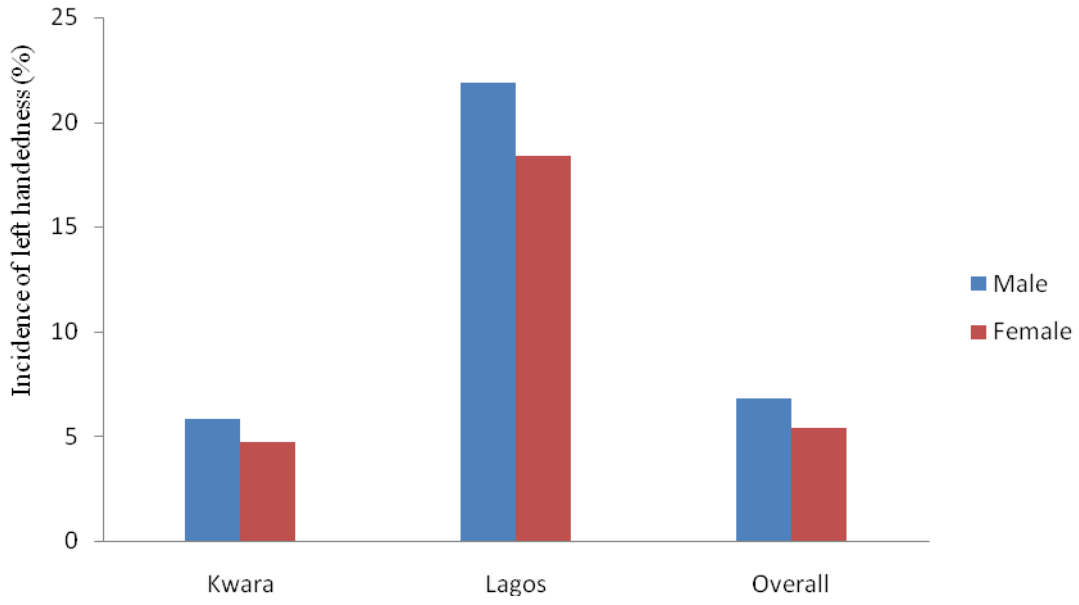

Figure 2: Overall incidence of left handedness among different sexes in Kwara and Lagos.

A total of 330 out of 2704 participants (12.2%) were left handedness which comprise of 78 and 252 from Kwara and Lagos respectively (Table 3).

Table 3: Overall incidence of left and right handedness in Kwara and Lagos

Location	**Left handedness (%)**	**Right handedness (%)**	**Total**
Kwara	78 (5.4%)	1372 (94.6)	1450
Lagos	252 (20.1%)	1002 (79.9%)	1254
Overall	330 (12.2%)	2374 (87.8%)	2704

Parentheses=percentages (%).

Data collected for this study are assumed to be the rate at which left handedness occurred in the places where participants were interviewed. The overall incidence of left handedness in Kwara state was 5.4%, though it ranged from 4.5% to 6.9% among different age groups. There was a higher prevalence of left handedness in Lagos ranging from 14.5% to 29.1% among different age group while the overall incidence was 20.1%. Result from our study showed that incidence of left-handedness in Kwara among different ages and sexes were less than the recorded values in Lagos.

The incidence of left handedness recorded in Kwara varies from 4.5% to 6.9%, the highest being recorded among group that is above 40 years old and the overall incidence recorded was 5.4%. This is in line with Porac *et al.* (1980), Gilbert and Wysocki (1992) and Roy *et al.* (2003) who reported that frequency of left-handers varies according to age groups. There is steady increase in incidence of left handedness among all ages in Kwara state except the deviation that was observed among age group 31-40 years old. This result showed that the highest incidence (6.9%) of left handedness was recorded among the older generation (>40 years old), this is contrary to our expectation that age appears to modulate the incidence in that left handedness decrease with age as reported by Oremosu *et al.* (2011a), Gilbert and Wysocki (1992), Roy *et al.* (2003), Vuoksimaa *et al.* (2009), Galobardes *et al.* (2001), Annett (1973), Salmaso and Longoni, 1985 and Coren and Halpern (1991). This could be interpreted as due to changing patterns of social norms (Hugdahl *et al.,* 1993): for example, writing handedness was submitted to more social pressures in the past than present (Dellatolas *et al.,* 1988) and education about left handedness has increased drastically, this might be the reason for the reduction forced handedness.

Prevalence of left handedness observed in Kwara state (5.4%) is higher than 1.5%, 3.1%, 4.6% and 5.0% recorded in Taiwan, Japan, Orientals and Japan by Teng *et al.* (1976), Hatta and Nakatsuka (1976), Porac *et al.* (1990) and Maehara *et al.* (1998), respectively. But it was lower than 6.8%, 8.7%, 9.1%, 11.2% and 12.0% recorded by India, Caucasians, Hispanic, UK and North American as reported by Mandal *et al.* (1992), Porac *et al.* (1990), Gilbert and Wysock (1992), Ellis *et al*, (1998) and Gilbert and Wysock (1992), respectively. When we compared our result with some African countries, incidence reported from Kwara state was lower than 8.1%, 10.7% and 13.0% recorded in Ntumu Southern Cameroun, Baka in Gabon and Jimi Valley Papua New Guinea reported by Carriere and Raymond (2000), Faurie *et al.* (2005) and Connolly and Bishop (1992) respectively, but higher than 3.1% reported in Dioula Burkina Faso by Faurie *et al.* (2005).

Incidence of left handedness (5.4% and 20.1%) in Kwara and Lagos reported in this study is higher than 4.9% recorded earlier in Nigeria by Perelle and Ehrman, 1994 and 3.9% recently reported in Enugu among university students Eze *et al.* (2009). The overall incidence (20.1%) recorded in Lagos was similar to 20.4% recorded in Eipo Iran Jaya reported by Faurie and Raymond (2005), lower than 22.6% reported in Yanomamo Venezuela as reported by Marchant *et al.* (1995), but higher than most other studies (Faurie and Raymond, 2005;

Faurie *et al.,* 2005; Oremosu *et al.,* 2011b; Ellis *et al.,* 1998; Carriere and Raymond, 2000; Perelle and Ehrman, 1994).

This present study also investigates prevalence of left handedness in males and females. In our studied population sampled from Kwara and Lagos states, we found more right-handed males than females. This was consistent with result from Peters *et al.* (2006), Oremosu *et al.* (2011a), Gueze *et al.* (2012) and a meta-analysis of sex differences in left-hand preference by Papadatou-Pastou *et al.* (2008) that reports an odds ratio of 1.20 for strong left-handedness, reflecting higher prevalence of strong left-handedness among males. But our result is in total disagreement with Connolly and Bishop (1992) who reported no significant sex differences in hand preference in a Papuan population. Our data is consistent with what was reported by Schaafsma *et al.* (2012) that Papuan men were more often left handed than women but this difference was not statistically significant. Incidence of left handedness in males and females from Lagos was 21.9% and 18.4%, this is similar 22.4% and 18.8% in males and females reported recently among Medical and Dental students in the University of Lagos-Nigeria (Oremosu *et al.,* 2011a).

High cultural acceptance has been linked with increase in incidence of left handedness (Medland *et al.,* 2009). Kwara and Lagos being in different geopolitical region in Nigeria is said to have different culture. Incidence of left handedness in Lagos is almost four times higher than what was observed in Kwara, this is because there may be high cultural acceptance of left handedness in Lagos due to higher civilization. This is similar to observations reported by Perelle and Ehrman (1994) and Peters *et al*. (2006) that observed variation in incidence of left handedness in different cultures and regions.

The overall incidence of left handedness in Lagos and Kwara was 12.2% this is similar to 12.0% recorded in North America by Gilbert and Wyosoki (1992) but greater than 3.94%, 6.8%, 8.7% and 11.2% recorded in Enugu, India, Caucasian and United Kingdom reported by Eze *et al.* (2009), Mandal *et al.* (1992), Porac *et al.* (1990) and Ellis *et al*. (1998), respectively.

4. Conclusion

Result from this study is the first in Nigeria that compare incidence of left handedness in diverse age group and different geopolitical zones in Nigeria. The main result of the present

study on left handedness from two geopolitical zones in Nigerian is that sex and geographical location are associated with hand preference, as participants in Lagos state were more likely to be left-handed than participant from Kwara state. More so, overall incidence recorded in this study is on the increase when compared to earlier studies in Nigeria indicating that there is more awareness towards left handedness thus there is reduction in social pressure against left handedness and increase in cultural acceptance of left handedness.

Although scientists are still working hard on the role of genes involved in establishing left from right in embryo development in order to explain the variation in handedness seen among humans, however, there is no doubt that, as seen in all aspects of human behaviour, nature and nurture play a dominant role. Therefore, it is reasonable to conclude that development of handedness is a complex mixture of genes, environment, and cultural pressure. People now tend to use left hand more often than before. Lastly, the incidence reported is among the highest recorded in recent times.

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