

## OCCUPATIONAL VAT DYEING PRACTICES IN THE KANO METROPOLIS OF NIGERIA- Part 1: Demographic/Socio-economic Characteristics of the Dyers and Composition of the Dyeing Enterprises

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### ABSTRACT

*Application of natural indigo vat dye is a popular traditional craft among many Nigerians particularly Hausa and Nupe in the north, Tiv in the middle belt and Yoruba in the west. Due to continuing decline of traditional indigo dyeing and availability of synthetic dyes, most occupational dyeing in Kano metropolis today is done with vat dyes and chemicals. The aim of this paper is to assess the demographic/socio-economic characteristics of the dyers as well as the nature and composition of the dyeing enterprises in Kano metropolis. The study was conducted among 1387 dyers and further information was obtained through focus group discussion, observation and records. Data were analysed by descriptive statistics (frequency and average) using statistical package for the social sciences (SPSS) software. Findings revealed that majority of the dyers were male within the age range of 18 to 65 years (mean= 31.27± 7.59). Most of the dyers are natives with some level of western education. They have varying job specifications where majority have learnt the art of dyeing by apprenticeship with work experience ranging from 5 to 31 years (mean= 11.11± 5.01) and about one half of them earning more than the minimum wage for civil servants in Nigeria. Vast majority of the dyers work as informal groups employing huge labour and operating in the neighbourhood of residential houses. The study recommends that the dyers should be encouraged to become formal in order to gain from Federal Governments' incentive to entrepreneurship development. The State Government in its part should create effective policies and intervention strategies that will sustain and improve on the venture since it has propensity to employ huge labour*

**Keywords:** vat dyeing, occupational dyers, cloth vendors, Kano metropolis, indigo

### INTRODUCTION

Dyeing and painting activities have accompanied the development of human culture since the early beginnings and different cultures, in many aspects totally unrelated and unconnected among them, have developed similar dyeing techniques using dyes from available natural colourants (Dagani et al., 2015). Natural colourants, which can be derived from plants, insects/animals, were the only dyes used for textile colouration until 1856 when William Henry Perkin accidentally invented the first synthetic dye from aniline (Zerin et al., 2020). The colourant content in natural dyes is relatively low, usually very small percentage of the dry material, thus considerable amounts of raw-materials have to be processed (Bechtold, 2013). Additionally, extraction of raw-materials is time consuming since plants are dependent on growing season and the dyes are generally impure (Gurses et al., 2016). Synthetic dyes offer advantages such as lower production cost, better resistance towards environmental factors, ease of application (Nidheesh et al., 2013), more

variations in colour shade and colour depth, independence from agriculture and/or farming, increased repeatability, and wide application fields (can dye many types of substrates using different methods) (Mussak and Bechtold, 2009). It is estimated that only 1 % of the total world textiles are dyed with natural colourants (Zerin et al., 2020), more than 100,000 commercial dyes are known with an annual production of over 700,000 tonnes per year, and that the total dye consumption in the textile industry worldwide is more than 10,000 tonnes per year (Yagub et al., 2014).

Textile dyes are classified into different application classes namely vat, disperse, acid, basic, direct, fibre reactive, pre-metallized, mordant (Christie, 2015; Wardman, 2018), solubilized, sulphur and azoic dyes (Wardman, 2018). Natural indigo, woad and tyrian purple belong to the vat class (Yusuf et al., 2017; Clark et al., 1993) among which indigo is very popular and is usually obtained from leaves and stems of indigo bearing plants mainly cultivated in

Africa, India and Southeast Asia (Saikhao et al., 2018). Indigo is considered as one of the most important industrial dyes due to continuing popularity of blue jeans and other blue denims (Park et al., 2012). Indigo dyeing using different plant species has been practised in Europe, west Africa, central Asia and America (Mcfoy, 2008). Indigo vat dyeing is a popular occupation in Nigeria and is more common in Kano, Sokoto, Zaria and Bida in the northern part of the country and Osogbo, Abeokuta, Oyo, Ibadan, Ede and some other towns in the south-west (Awogbade-Mabel, 2010; Akinbogun and Ogunduyile, 2009).

Production of synthetic indigo in 1880 led to the industrial synthesis of the dye in 1887 resulting in rapid decline of traditional dyeing with natural indigo globally (Meksi and Mhenni, 2015). Since the 1930s, the Yoruba people of south-western Nigeria began incorporating synthetic vat dyes and chemicals and most dyeing in the major dyeing centres of Abeokuta, Lagos and Ibadan today is done with synthetic dyes (Byfield, 1994). Synthetic vat dyes and chemicals are currently used by many Nigerian occupational dyers (Bankole et al., 2019; Bankole et al., 2017; Okareh et al., 2017; Oguntade et al., 2018; Owoeye, 2017). A lot of work has been done to study occupational vat (including indigo) dyeing in Nigeria especially the history of the dyeing occupation (Taylor, 1975; Bayfield, 1997; Murray, 1943; Rice, 2015; Byrne, 1981), demographic (Awogbade-Mabel, 2010) and socio-economic characteristics (Saheed, 2013) of the dyers, geography of the dyeing centres in Abeokuta (Aro and Kalilu, 2013), and the role of women in indigo dyeing (Nast, 2008; Bayfield, 1997) among others.

Despite the fact that synthetic vat dye has been used in Nigeria for about 90 years and that several studies investigated occupational dyers in Abeokuta, until now, very little work has been done to examine the activities of the non-industrial vat dyers in Kano metropolis. Previous studies were mainly on toxicity of the dyes used (see Abdullahi et al., 2016 and Sani et al., 2018). In this paper, which is the first of a 6-part series, we report the results from an investigation of the demographic and socio-economic characteristics of the dyers and composition of the dyeing enterprises. Kano metropolis was selected because the ancient city has attracted historical prominence since the 14th century with its fine indigo dyed cloth (Ezeanya-Esiobu, 2019) and currently there are many secondary dyeing units in the area that are engaged in non-industrial dyeing using synthetic vat dyes and chemicals. The study will contribute in addressing

the fundamental questions: What are the demographic and socio-economic characteristics of the dyers? What is the nature and composition of the dyeing enterprises? The study will focus on dyers using synthetic vat dyes and chemicals.

## MATERIALS AND METHODS

### Study Area

Kano metropolis (Figure 1) is among the Nigeria's 4 largest urban areas and it is also the largest in the northern part of the country (Garba, 1997). By the beginning of the 20<sup>th</sup> Century Kano city was the largest urban settlement in Hausa land and comprised of the space within the wall and the adjoining Fagge settlement just outside it. It later translated in space as Nassarawa and Bompai (for the Europeans) and Sabon-Gari (for non-Europeans and non-natives). Later, Tudun Wada, Gwagwarwa and Brigade (for natives) came into existence where all together these residential units with the old Kano city were known as Kano township which formed what is referred to as Urban Kano (Umar *et al.*, 2019). The oil boom era developments have incorporated adjoining villages such as Gama, Dawakin Dakata, Hotoro, Kawo, Giginyu, Unguwa Uku, Na'ibawa, Sharada and Dorayi into the urban Kano and transformed into a metropolis (Liman, 2015).

Kano metropolis is boarded by Madobi and Tofa Local Government Areas to the South West, Gezawa to the East, Dawakin Kudu to the South East, and Minjibir on the North East. The metropolitan area comprises 6 core local governments (Dala, Fagge, Kano Municipal, Nassarawa, Gwale, and Tarauni) and 2 peri-urban local governments (Kumbotso and Ungogo) (Balogun *et al.*, 2020). It has an estimated population of 3, 507, 632 as at 2014 (Weber *et al.*, 2017) with a population density of about 1000 inhabitants per km<sup>2</sup> compared to the national average of 267 per km<sup>2</sup>. It lies between Lat. 10° and 12°N and Long. 8° and 9°E with an area of 600 km<sup>2</sup>, an altitude of 488 m above sea level (Suleiman *et al.*, 2020) and predominantly comprised of Hausa and Fulani ethnic groups who are mostly Muslims (Iliyas, 2000). *Kofar Mata*, *Zage*, *Karofin Gangamau*, *Kankarofi*, *Karofin Sudawa*, and *Karofin Kwalwa dye pits*, all in Kano Municipal, were formally involved in traditional indigo dyeing. Presently, the only surviving dye-pits are that of *Kofar Mata* and most of the dyers today use synthetic vat dyes and chemicals. For the purpose of this study, the respondents are called "dyers" and non-industrial dyeing units are referred to as dyehouses.

### Data Collection and Analysis

The study relied on data gathered through a structured questionnaire, focus group discussion, observation, and records. A structured questionnaire was developed according to standard protocol for questionnaire design and testing as described by Geer et al (2006) and questions were developed as a result of insight from Johnson (1999). The validity of the coverage of questions included in the questionnaire (content validity) was gained through experts in the field, colleagues as well as members of the target population. Reconnaissance visits were made in June, 2020 to locate the dyers. The developed questionnaire was pretested among the dyers that did not participate in the study and during the reconnaissance visits. Variability in dyers response and the understanding of question content (face validity) were evaluated and this information was used to produce a revised final version of the questionnaire, specific questions were added where content coverage was lacking and questions were rephrased where understanding was vague. The questionnaire was prepared in English but was communicated to the dyers in their local dialect (Hausa).

This part of the series covered 18 questions in 2 sections. The 1<sup>st</sup> section (section A consisting of 13 questions) dealt with demographic and socio-economic characteristics of the dyers (e.g. age, level of education, state of origin etc.), and the 2<sup>nd</sup> section (section B consisting of 5 questions) dealt with composition of the dyeing enterprises (e.g. type of the enterprise, number of dyers per enterprise, location of the enterprises etc.). The research population is the total number of occupational vat dyers in Kano metropolis and participating dyers were chosen as a purposive sample. A total of 1387 questionnaires were administered in 20 dyehouses (geographical locations of the dyehouses are shown in part 1 of the series) where willingness to participate in the study was confirmed through completed consent form. Dyers who are at least 18 years of age and had worked for at least 5 years in the dyehouses were eligible to participate in the study.

Data was collected from August to December, 2020, with the dyers working, through self-completed questionnaire by the researcher and 3 enumerators over a duration of 25-30 minutes with each dyer being asked the same question in the same order. A monetary incentive of ₦3000 (\$7.75) was provided for participation due to initial reluctance to participate because according to the

dyers, the Chinese used similar approach to learn their techniques. Before initial data screening all the completed questionnaires were coded and entered in Excel software after which the data were analysed by descriptive statistics (frequency and average) using SPSS version 26. Hand-held GarminTrex 30 GPS receiver was used to obtain the coordinates of the dyehouses visited (DA-DT) which are located within the 8 Local Government Areas (Table 1).

Other data sources included observations while the dyers are on the job and records from Kano State Ministry of Commerce and Industry and Kano Amalgamated Dyers (a non-formal association of the dyers). Additional information was obtained from focus group discussion with the researcher, assistant researcher and 7 dyers, 1 from a dyehouse in each of 7 local government areas (Nassarawa was not represented) in December, 2020 selected by purposive sampling technique. Two key informants were used in the study. Aliyu Umar, a wholesale colour vendor, whose nature of business permits him to know the major dyers in Kano metropolis as well as cloth vendors in the market, and Mallam Haruna Baffa who has valuable information being the Secretary of “Kofar Mata” dyers Association coupled with his exposure having attended numerous exhibitions of Africa by Design namely Ghana (2016 and 2019), Dubai (2017), London (2018), United States (2019) and Abuja (2020).

Focus group discussion with the dyers centred on a short list of 3 open-ended questions namely how they start the dyeing occupation, the nature and composition of their dyeing facility, and their registration status. Focus group discussions were audiotape-recorded so that reference could be made to the remarks of the participants in order to ascertain common themes. Focus group discussion lasted for 2 hours and was recorded using paper and pencil. Dollar exchange rate has fluctuated considerably between 2020 till date. (exchange rate of ₦386.96 per US\$ as at 30<sup>th</sup> August, 2020 was used where dollar equivalent is given in the text).

## RESULTS AND DISCUSSION

### Demographic and Socio-economic Characteristics of the Dyers

All the 1387 (100 %) administered questionnaires were adequately self-completed and the results of the demographic and socio-economic

characteristics of the dyers are shown in Table 2. The ages of the dyers ranged from 18 to 65 years (mean=  $31.27 \pm 7.59$ ) where majority were aged 21 to 40 years indicating that they are predominantly of youthful age. In contrast, a study of local dyers in Ghana indicated that only about two fifth were aged 17-40 years (Asmah and Sherifatu, 2016). Majority of the dyers were male which may be because of the traditional and religious beliefs of the people in the study area (mostly Hausa-Muslims). According to Barau (2007), majority of the population in Kano metropolis is Hausa/Fulani with Hausa language being the vernacular and more than 90 % of the people are Muslims. The dominance of male dyers can also be due to the strenuous nature of the job, long working hours and inconvenient worksite. The latter reasons were given for male domination in dyeing and printing occupation (Paramasivam et al., 2010). Traditionally, indigo vat dyeing in most west African communities is a female task (Acquaye, 2018) and even recently, studies have shown that there were more female dyers in Abeokuta (Saheed, 2013; Acquah and Oduro, 2012). A little above one half of the dyers were single which may be due to the fact that civilization and economic realities have changed the concept of early marriage in the region.

Most of the dyers schooled above primary education while only a few (4.6 %) lack western education. The dyers revealed that some of them used dividends from the dyeing occupation to sponsor their education and as a result, there are currently teachers, lawyers and other civil servants in the dyeing business. Similarly, dyers in Abeokuta were found to have more secondary education (Adekunle et al., 2017). According to an annual education sector performance report, the gross intake rate into 1st grade of primary education is 118 % indicating an adequate access to primary education in the state where the metropolitan area has a good share of both public and private primary and secondary schools (Kano State Ministry of Education, 2010).

The dyehouses are spread across the 8 metropolitan local government areas of the state where more dyers were found in Gwale followed by Fagge with very few in Nassarawa (2.5 %). Table 1 shows that 33 % of the 20 dyehouses visited are located in Gwale. Vast majority of the dyers are natives as is the case of local dyers in Ghana (Asmah and Sherifatu, 2016; Acquah and Oduro, 2012) with very few foreigners from Mali and Gambia. Similarly, the presence of dyers from

other African countries working with local dyers in Lagos, Nigeria, has been reported (Areo and Kalilu, 2013). The dyers disclosed that it was a woman that started the art of tie-dye using synthetic vat dyes and trained many people in Gwale for the past 35 years, and also many Malians and Gambians have learnt the art of dyeing in their home country and relocated to Kano to establish the venture thereby training a lot of youths in Fagge. Decline in the dyeing venture among other reasons forced most of the foreigners back home while some of them have changed line of business.

Job specifications among the dyers include colour mixing, dyeing, rinsing/starching/drying and marketing where more individuals were involved in the actual dyeing job. The marketers among them have some level of capital and hardly participate in the actual dyeing due to the toxicity and hectic nature of the job. For those reasons, the marketers are frequently involved in colour mixing and some of them own stalls along the streets of "Kantin Kwari" cloth market where they sell dyed cloth. It is the marketer's responsibility to find customers, provide the site, tools and raw-materials needed for dyeing and to assign job specifications. Some individuals engaged in rinsing/starching/drying can also partake in dyeing depending on job availability and quality requirement. About three fifth of the dyers have learnt the art of dyeing by apprenticeship which is contrary to traditional indigo dyeing in Kano where the craft is passed on to many generations. Nowadays, dyeing with synthetic dyes in Kano metropolis has become a highly specialized art where apprentices have to spend years to learn from their master before establishing their own dyehouse. In contrast, Saheed (2013) has reported that 56.25 % of dyers studied in Abeokuta, who use synthetic dye and chemicals, have learnt the art of dyeing through long standing tradition in the family usually inherited by birth and the heritage passed onto many generations.

Work experience ranged from 5 to 31 years (mean=  $11.11 \pm 5.01$ ) where a little more than one half of the dyers have worked for 1-10 years and nearly one half have been working for more than 10 years. Similarly, Adekunle et al (2017) reported that 40 % of the dyers investigated in Abeokuta had more than 10 years work experience. About two fifth of the dyers survive solely on the dyeing occupation while the rest are additionally involved in other activities namely trading, calendering, tailoring, civil service and others among which trading is more prevalent. This is in line with the



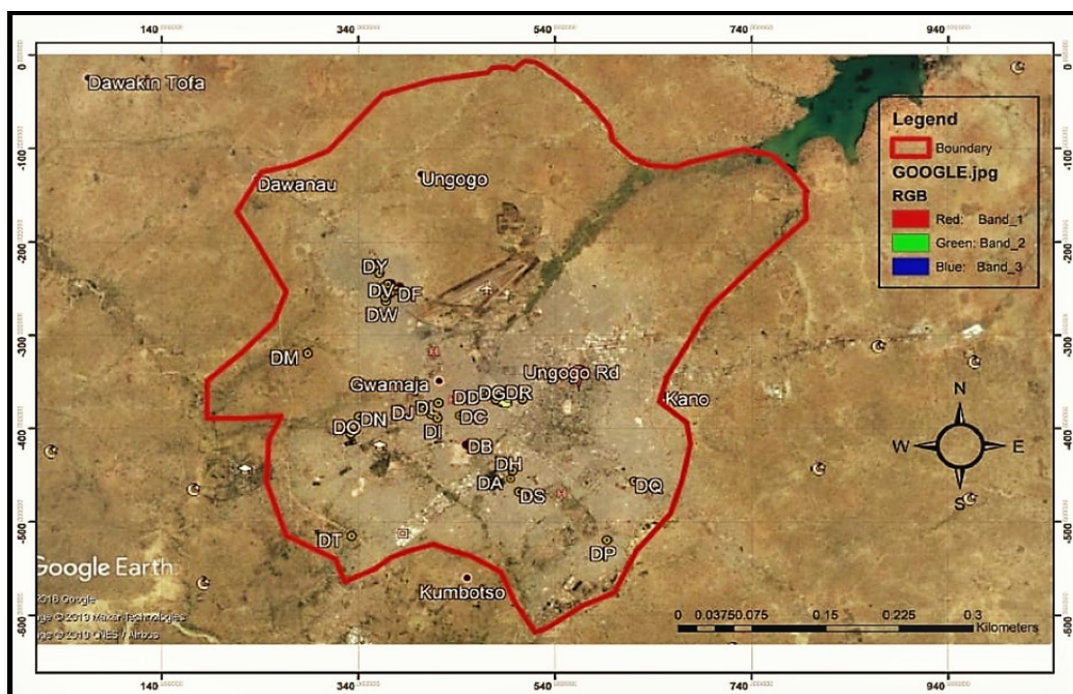


Figure 2: Geographical location of the dyehouses visited (Field work, 2020)

Table 1: Coordinates of the dyehouses visited

| Dye houses | Longitude  | Latitude     | LGA            |
|------------|------------|--------------|----------------|
| DA         | 11°58.128' | 008° 31.901' | Tarauni        |
| DB         | 11°58.947' | 008° 30.862' | Gwale          |
| DC         | 11°59.655' | 008° 30.696' | Gwale          |
| DD         | 12°00.182' | 008° 31.392' | Kano Municipal |
| DE         | 12°02.630' | 008° 29.085' | Fagge          |
| DF         | 12°02.698' | 008° 29.230' | Fagge          |
| DG         | 12°00.040' | 008° 31.559' | Kano Municipal |
| DH         | 11°58.324' | 008° 31.951' | Kano Municipal |
| DI         | 11°59.598' | 008° 30.184' | Gwale          |
| DJ         | 11°59.825' | 008° 29.857' | Dala           |
| DK         | 11°59.967' | 008° 30.210' | Dala           |
| DL         | 11°59.683' | 008° 30.047' | Dala           |
| DM         | 12°01.162' | 008° 27.131' | Ungogo         |
| DN         | 11°59.628' | 008° 28.341' | Gwale          |
| DO         | 11°59.216' | 008° 28.148' | Gwale          |
| DP         | 11°56.640' | 008° 34.169' | Kumbotso       |
| DQ         | 11°58.065' | 008° 34.810' | Nassarawa      |
| DR         | 11°58.050' | 008° 32.186' | Tarauni        |
| DS         | 11°57.809' | 008° 32.100' | Tarauni        |
| DT         | 11°56.737' | 008° 28.167' | Gwale          |

Table 2: Demographic and socio-economic characteristics of the dyers

| Personal characteristics | Frequency<br>(%), n= 1387 | Personal characteristics              | Frequency<br>(%), n= 1387 |
|--------------------------|---------------------------|---------------------------------------|---------------------------|
| Age group                |                           | Job specification                     |                           |
| 10-20                    | 102 (7.4)                 | Colour mixing                         | 365 (26.3)                |
| 21-30                    | 587 (42.3)                | Dyeing                                | 562 (40.5)                |
| 31-40                    | 602 (43.4)                | Starching/Rinsing/Drying              | 233 (16.8)                |
| 41-50                    | 64 (4.6)                  | Marketing                             | 227 (16.4)                |
| 51-60                    | 24 (1.7)                  | Job learning method                   |                           |
| 61-70                    | 8 (0.6)                   | Trial and error                       | 98 (7.1)                  |
| Sex                      |                           | Observation                           | 342 (24.7)                |
| Male                     | 1265 (91.2)               | Apprentice                            | 881 (63.5)                |
| Female                   | 122 (8.8)                 | Long standing tradition in the family | 54 (3.9)                  |
| Marital status           |                           | Formal training                       | 12 (0.9)                  |
| Married                  | 670 (48.3)                | Years of experience                   |                           |
| Single                   | 706 (50.9)                | 1-10 years                            | 727 (52.4)                |
| Divorced                 | 4 (0.3)                   | 11-20 years                           | 627 (45.2)                |
| widowed                  | 7 (0.5)                   | 21-30 years                           | 25 (1.8)                  |
| Level of education       |                           | 31-40 years                           | 8 (0.6)                   |
| Primary education        | 188 (13.6)                | Additional source of income           |                           |
| Secondary education      | 817 (58.9)                | None                                  | 596 (43)                  |
| Tertiary education       | 318 (22.9)                | Calandering                           | 140 (10.1)                |
| Qur'anic education       | 64 (4.6)                  | Tailoring                             | 63 (4.5)                  |
| Local government area    |                           | Trading/Cloth vending                 | 413 (29.8)                |
| Fagge                    | 264 (19)                  | Civil service                         | 52 (3.7)                  |
| Gwale                    | 528 (38.1)                | Others                                | 123 (8.9)                 |
| Kano municipal           | 183 (13.2)                | Monthly income from the dyeing job    |                           |
| Nassarawa                | 35 (2.5)                  | ₦1,000-₦10,000                        | 366 (26.4)                |
| Ungogo                   | 68 (4.9)                  | ₦11,000-₦20,000                       | 226 (16.3)                |
| Dala                     | 125 (9)                   | ₦21,000-₦30,000                       | 61 (4.4)                  |
| Tarauni                  | 52 (3.7)                  | ₦31,000-₦40,000                       | 244 (17.6)                |
| Kumbotso                 | 132 (9.5)                 | ₦41,000-₦50,000                       | 223 (16.1)                |
| State of origin          |                           | Above ₦50,000                         | 267 (19.3)                |
| Kano state indigenes     | 1328 (95.7)               |                                       |                           |
| Non-indigenes            | 59 (4.3)                  |                                       |                           |
| Nationality              |                           |                                       |                           |
| Nigerians                | 1333 (96.1)               |                                       |                           |
| Malians                  | 17 (1.2)                  |                                       |                           |
| Gambians                 | 37 (2.7)                  |                                       |                           |

Figure 5 shows that most of the dyers investigated were members of an informal association called 'Kano Amalgamated Dyers' whose objectives are to protect the integrity of its members and assist those that fall victims of occupational hazards but only about 17 % of them benefitted as members. Based on the record of the association, it has registered 932 members. Majority of the dyers belong in a group of more than 10 persons per dyehouse as shown in Figure 6. Based on job specifications among the dyers namely colour mixing, dyeing, rinsing/starching/drying and marketing, every dyeing cycle requires at least 5

individuals which mimics a continuous dyeing process. This indicated that the occupation is an employer of labour. According to Junne (2018), there were about 480 million youth in Africa with 10-13 million entering the job market every year and only 3 million getting wage employment and government cannot provide those jobs. Due to scarcity of jobs, people were forced to be creative resulting in a large number of necessity entrepreneurs. Additionally, Small and Medium Enterprises (SMEs) are believed to be responsible for more than 50 % of the new jobs created globally and in developing countries they employ

more people than large scale enterprises (ILO, 2014a). Figure 7 shows that most of the dyers work in the neighbourhood of residential houses while only less than one fifth work in the house of owner/group member.

The dyers disclosed that working in the vicinity of residential houses is manageable since the choice of a spot suitable for dyeing only depends on availability of water, drainage and adequate space to dry the dyed materials. Dyeing in the house of owner/group member usually involves female dyers who for reasons stated previously, cannot work amidst male dyers in the neighbourhood. Dyeing in the house is possible for small lot/order and only where the house is large enough. The

setup of the dyehouses vary and some of them are similar to those described in an area in India where dyeing is carried out in the courtyard of residential houses and then dried in an open space in the neighbourhood (Singhi *et al.*, 2005). It was learnt that the enterprises are not regulated by any organization and majority do not pay for rent or tax to the government. Similarly, it has been reported that informal sectors are usually neither recognized nor regulated or protected under labour and social protection legislation (ILO, 2014b). Findings of this study collaborate well with the fact that small and micro business in Africa are mostly informal, unregistered, unlicensed and typically do not pay taxes (Igwe *et al.*, 2018).

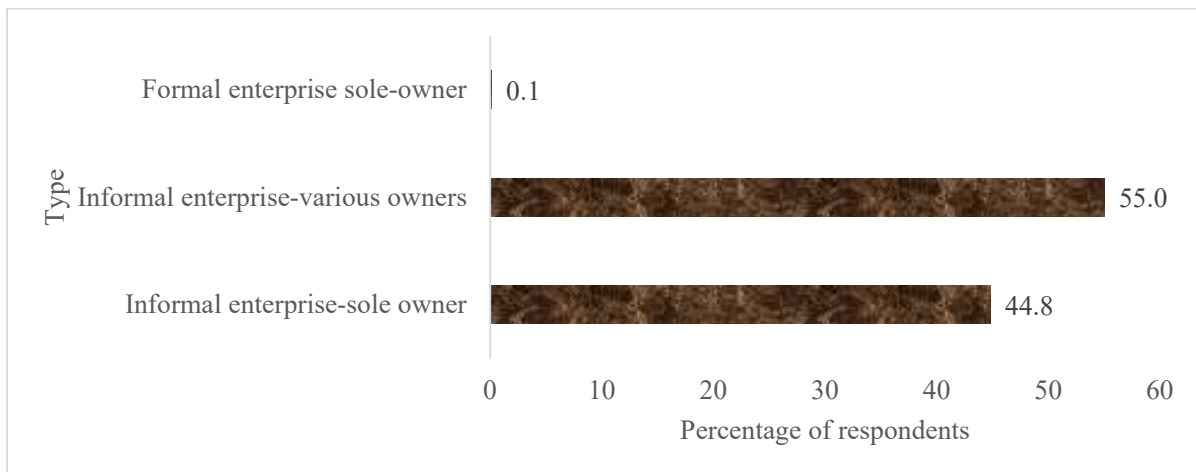


Figure 4: Type of the enterprises

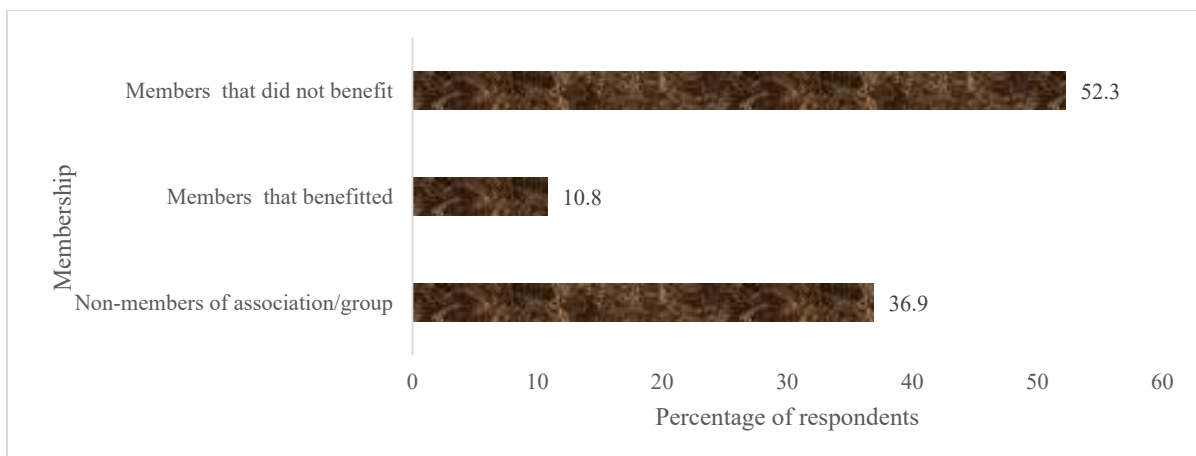


Figure 5: Membership to an association/group

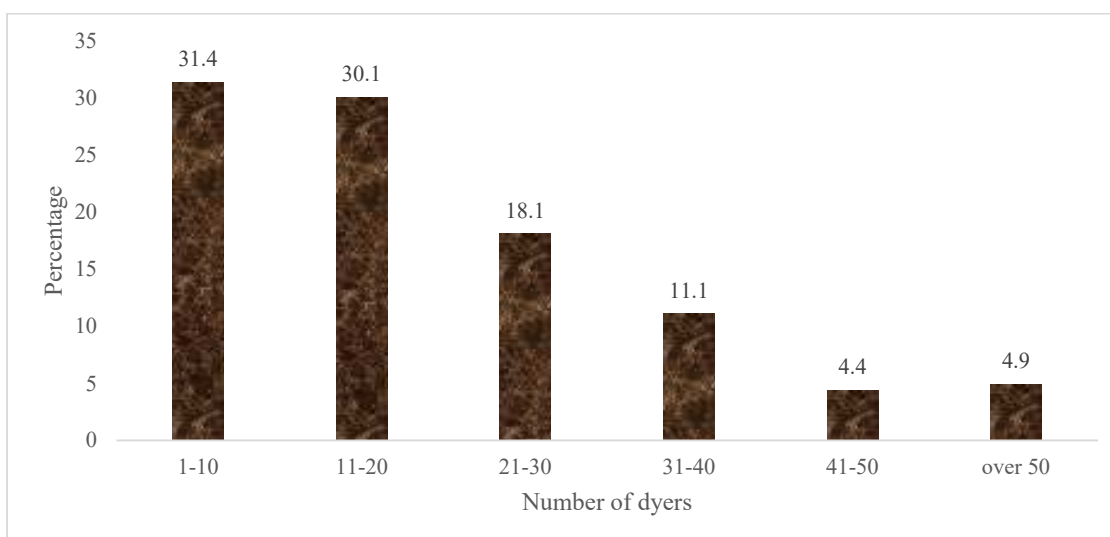


Figure 6: Number of dyers per dyehouse

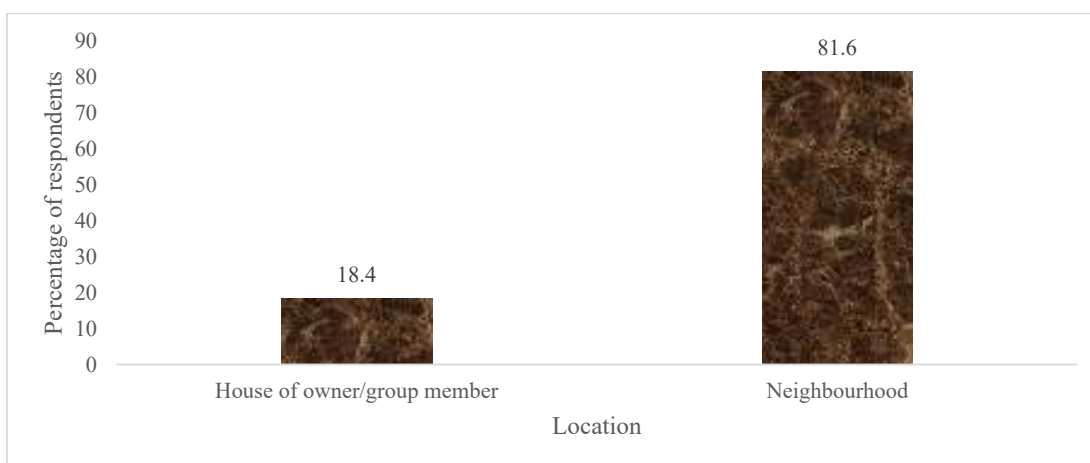


Figure 7: Location of the enterprises

## CONCLUSION

Occupational vat dyers in Kano metropolis were predominantly male, educated, and natives. The mean age and years of experience were  $31.27 \pm 7.59$  and  $11.11 \pm 5.01$  respectively indicating that the dyers are predominantly youth with a lot of experience. Majority have learnt the art of dyeing by apprenticeship and can earn more than the minimum wage for civil servants ( $> \text{₦}30,000$  per month) where about two fifth depend solely on the dyeing occupation. Most of the dyeing enterprises were informal, located in the neighbourhood of residential houses, and work in groups of more than 10 dyers per location. The dyeing activity, even though non-industrial and carried out by informal groups, can contribute greatly to employment of youths thereby alleviating poverty which is a big problem in this part of the country. The dyeing enterprises, by their nature, may find it difficult to benefit from government support for entrepreneurs because most government agencies

such as Small and Medium Enterprise Development Association of Nigeria (SMEDAN) will demand certification with CAC before rendering any kind of assistance. The study recommends that the dyers should be encouraged to become formal in order to gain from Federal Governments' incentive towards entrepreneurship development. The State Government in its part should identify and visit the dyehouses in order to provide suitable locations and capital base which may help sustain the venture since it has propensity to employ huge labour. Further research should focus on the operations of the dyers, the dyeing processes, challenges and prospects of the dyeing occupation, chemical exposure, hazard, and safety practices, as well as waste management and potential environmental impacts of the dye effluent.

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