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IDENTIFYING SURROGATE VARIABLES IN THE OCCURRENCE OF DRACUNCULIASIS: A CASE STUDY FROM OYO STATE, NIGERIA

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ABSTRACT

This paper explains, using a case study, the occurrence of dracunculiasis in relation to the water handling habits of the people as part of the socio-cultural stimuli in May's (1958) framework. Put simply, how has the behavioural aspects of water consumption habits aided the occurrence and the spread of guineaworm in the study area.

The data for the study were collected from two settlement with a relatively homogenous population in terms of occupation, literacy level and sources of obtaining drinking water. The two settlements that are barely three kilometres apart however differ markedly in the rates of guineaworm occurrence. The data obtained from the two settlements through stratified random sampling technique were analysed to investigate the possible factors for the observed variation in levels of infection.

The data were analysed using simple statistical techniques and the results of the analysis show that the two settlements consumed from similar sources of water but differ, sometimes markedly, in their habits of handling water. Water handling habit is defined to include water treatment, storage, fetching, etc.

The implication of the study includes that the total control of guineaworm or any water borne disease for that matter can rarely be achieved through the provision of portable water but also a redirection of the orientation of the people towards better water handling habits.

INTRODUCTION

Nigeria is today confronted with health problems that are too overwhelming. Some of these, according to Ajaegbu (1990) relate to the survival, existence and spread of several diseases within our environment, while some are related to the perception and behaviours of our people regarding the various levels of their environment and their sanitation standards.

Scholars are of the opinion that the type of natural environment in which man lives has to do with the type(s) of diseases they suffer from (Onabamiro 1951, etc). However the interrelations between the host and the elements of the environment are so varied that it is not easy to find out the causal relationships between the two. Much of what has been done

so far is to determine the environmental factors to which different diseases are associated. In the present study, an attempt is made to characterise the incidence of diseases such as guineaworm in terms of the socio-cultural environments that predispose man to their occurrence.

Guineaworm being a diseases contacted through drinking of unwholesome water is prevalent in the rural areas where safe drinking is not available or inadequate. In several local government areas in Oyo State, guineaworm is considered to be one of their commonest disease. The impact of this disease is greatest in the farming communities and in those afflicted, periods of incapacitation may be up to three months or more. The period usually coincides with the time of harvest of crops or early planting season leading to grave economic and social consequences apart from the terrible inflammation suffered by the victims.

STUDY AREA

The setting for the study is Oriire Local Government of Oyo State. There are 92,438 inhabitants in the local government with a total of about 311 villages scattered over its 2,040 squared kilometre area. Out of these villages only five enjoy pipe borne water in a less than regular routine, others still drink from wells or other doubtful sources. Over 80% of the inhabitants are farmers responding invariably to the imposition by the typical rural condition of the area. Women are more in the distributive trade and food preparation while men are involved in crop production. The wet and dry seasons are marked resulting in about five months of dryness from October to February and seven months of rain usually from March to September. However, there is always a break of rain towards the end of July and the beginning of September. This is otherwise called the 'August break' leading to a double maxima of rainfall each year. The drainage pattern is therefore affected by the variation in the seasons. Except the Oba river - a major tributary of river Ogun other rivers are seasonal, fluctuating from negligible discharge in the first half of the year to a high discharge in the second half.

In the dry season, many of the rivers are practically dry or form ponds along their channels. These rivers constitute the most significant source of drinking water in the local government. These ponds and streams supply brown-muddy water which are infected with guineaworm, cyclops and other disease pathogens. Many villagers have dug wells with the aim of getting all-year-round water supply, unfortunately, locating groundwater in the weathered mantle of the basement complex is often based on trial and error and as such there is resort to the traditional sources of water-the unwholesome ponds and stream. The impure state of water and a virtual absence of chemical treatment before drinking the water by most people expose them to health hazards especially of diseases that are water borne like guineaworm.

CONCEPTUAL FRAMEWORK/SIGNIFICANT OF THE STUDY

The Hippocratic corpus constitutes today the essential basis of modern medicine and forms the bedrock of any writing on medicine. This is because it encompasses the various complementary aspects of modern science and practice. Hippocrates made it clear as early as 4th century B.C. that "diseases are not caused by demons or capricious deities but rather by natural forces that obey natural laws" (Henschen, 1966). Hippocrates noted that the well being of man is under the influence of the environment including the particular ".....air, water, places and various regimens". He in fact recognised health as the expression of a harmonious balance between the various components of man's environment and ways of life". This declaration by Hippocrates form the basic principle on which diseases including guineaworm are conceptualised.

May (1958), observed that in order for disease to arise, there must necessarily be a coincidence in time and space of agents and hosts. His assertion was that the environmental stimuli and those that make the tissue suited" to the disease must be satisfied.

The environmental stimuli according to him include the physical agents, organisms/pathogens and socio-cultural factors. Invariably, but subtly, there is the recognition of the socio-cultural factors in disease and its epidemiology. However, within May's framework, a central problem in associative studies is to understand those factors which result in the spatio-temporal coincidence of agents and hosts (Raheem, 1992).

Given the above, the present study explains using a case study the occurrence of dracunculiasis in relation to the water handling habits of the people as part of the socio-cultural stimuli in May's framework.

METHODOLOGY OF DATA COLLECTION

Two settlements Adafila and Kajola selected for this study present surrogate variables in the occurrence of guineaworm in the area between 1988-1990. The two settlements are about three kilometers apart. The settlements have similar sources of water and above all, their inhabitants exhibited relatively homogenous population characteristics, farming being the commonest occupation. However, during the active case searches, between 1988-1990, the result of a survey by Nigerian Guineaworm Eradication Programme (NIGEP 1991) revealed that Adafila with 54, 81 and 200 reported cases for 1988, 89 and 90 respectively (highest for the local government) where as Kajola reported no case during the same period. In essence, guineaworm infestation in Oriire local government had followed a consistent pattern of occurrence since 1988 and had been restricted to the so called thirty-two (32) guineaworm villages in the local government. Therefore for ease of analysis, Adafila and Kajola were selected as reference settlements. A structured questionnaire was administered in the two settlements, each having seventy-five respondents. Each of the settlements was divided into five zones based on the number of mosques in these settlements. Fifteen households were picked from each zone using tables of random numbers. The heads of the households or any member of the households above the age of ten were interviewed. The household as used in the study refers to a person or group of persons living under the same roof and think of themselves as a unit (figure 2).

STUDY OBJECTIVE

The objective of this study is to:

- i. investigate whether or not infestation of guineaworm varies with differences in socio-economic characteristics of age, occupation and education;
- ii. investigate other factors responsible for the observed spatial inconsistency exhibited by the disease in the reference settlements.

Here attempt is made to establish the relationship that may exist between water handling habits (treatment, storage and fetching) and guineaworm infestation.

ANALYSES AND FINDINGS

Guineaworm infestation in the study area depicts some selectivity in their demographic characteristics in terms of age, sex, literacy level among others.

The result of the survey carried out for the purpose of this study showed that 44 out of the 75 people interviewed at Adafila were males out of whom 39 or 89% were infected representing about 68.0 percent. This gives the impression that infestation is rampant among males than females. Moreover, a X^2 analysis on this figure showed that the difference in infestation between males and females is statistically significant (X^2 calculated (3.84). It is therefore accepted that guineaworm infestation is sex selective. The high incidence among males could be because of the higher potentials the males have to be in contact with unsafe sources of water both at home and on their farms. However, the four cases reported at Kajola were shared equally between the two sexes.

The report of the active case searches conducted by NIGEP in the local government between 1988-1990 showed that 22.3, 21.0 and 23.4 percents of the children were infested in 1988, 1989 and 1990 respectively while the remaining infestation were recorded among adults. The definitions of the terms 'adults' and 'children' were not given in absolute terms; however the general assumption is that the 'children' are those of school age while the adults were those that were older than school age.

A X^2 analysis was conducted to further investigate whether or not the infestation is age selective. The result shows that infestations are related to age. (Note X^2 calculated = 1.16, X^2 tabulated = 3.84). Therefore guinea worm could be said to be more rampant among the adult population. The probable reason being that the water that is given to the children is usually treated.

LEVEL OF EDUCATION AND GUINEAWORM OCCURRENCE

Guineaworm was shown to be rampant among the illiterate population. The survey revealed that at Adafila, the highest percentage infestation of about 85 was among those that had either primary school certificate or Arabic school. It is shown that majority of the people (81%) in this community among those infested were moslems who used water for not only

drinking but also for performing ablution and ritual baths especially during prayers which is done at least five times daily thereby increasing their tendency to use water containing guineaworm cyclops. An infestation rate of about 83% was recorded among the characteristically conservative illiterate population could be traced to the fact that this group like their counter - parts anywhere would be hard to convince of the need to treat water before drinking or adopt any health education programme.

Generally, the pattern of distribution of infection showed that the percentage infection decreases with increasing levels of education except among the primary and Arabic school certificate holders. A X^2 analysis was also carried out on this and its result further proved that the infestation vary significantly among educational status. In fact the four victims at Kayola were among the illiterate group.

OCCUPATION AND GUINEAWORM OCCURRENCE

The highest rate of guineaworm occurrence was among the farming population i.e. 30 out of the 35 respondents at Adafila were infested while the four infestation recorded at Kajola was among the same group. The probable reason is that apart from drinking, most of the farming activities such as harvesting of crops like Melon and processing of yam tubers into flour etc. involve the use of water which increases the risk of being in contact with guineaworm cyclops. Moreover, the traders were also more susceptible, with infestation of 20 out of the 24 'trader' respondents (83.3%) while the craftsmen recorded (60%, affecting six out of the ten interviewed). The problem with these two groups is that trading/craftsmanship are always combined with farming to the extent that one may not be able to point out clearly the influence of trading or crafting on guineaworm infestation.

WATER HANDLING HABITS AND GUINEAWORM OCCURRENCE

Water Storage

Not all water collected is consumed immediately, some quantity is stored. The result of the survey for this study showed that people in the reference settlements stored their water either outside or inside the house while materials like clay pots, metal buckets and 'others' (including jerry-cans, plastics, etc) were used as storage means. The two settlements do not differ markedly as regards where they stored their water as majority of respondents normally store their drinking water inside the house (77.3% at Adafila and 73.2% at Kajola). The survey showed that the highest number of people in both villages stored their water for drinking in clay pots whereas 20% and 13.3% at Adafila and Kajola respectively used other storage means such as jerry-cans, etc. However, the analysis on the mode of storage and resultant infestation at Adafila alone gave a calculated X^2 of 8.38 whereas the table value at 5% confidence was 5.99. Therefore the null hypothesis that guineaworm infestation is not influenced by the materials used for storage is rejected and the alternative hypothesis accepted. The implication of this finding is that guineaworm occurrence vary significantly according to materials used for storing water; meaning that certain storage medium aids the growth and/or survival of guineaworm cyclops.

TABLE I: Mode of Storing Water and Guinea worm Occurrence at Adafila

Mode of Storage	No. Infected	No. Not Infected	Total
Clay Pot	27	13	40
Metal Bucket	19	1	20
'Others'	14	1	15
TOTAL	60	15	75

Source: Author's Field Survey

X^2	Calculated	=	8.38
X^2	Tabulated	=	5.99
Confidence Levels	=	5% at (n-1) Degree of Freedom.	

WATER FETCHING HABIT

Women (housewives), young males, young females and water vendors were the four groups used by different households in the two reference settlements to fetch drinking water. At Adafila, 29.5%, 36% and 13.3% out of the 75 households sent their housewives, young females and young males respectively to fetch the water while only 21.3% brought water from the water carriers. The implications of this is that households where young children fetched water recorded higher rates of occurrence. The probable reason being that young children are unlikely to be careful enough to fetch settled water. This increases the likelihood of fetching the water that are cyclops-laden. However, water carriers were fetching purely for commercial purposes and may be interested in the number of buckets fetched per day rather than the quality of water fetched. This may also explain the reason for the higher occurrence in the households that use this medium for obtaining water.

The result of the analysis (X^2) on table 2 gave a calculated chi of 4.45 while the table value at 5% confidence was 7.82. Therefore we accept that a significant statistical variation exists between the categories of people that fetches the household drinking water and corresponding guinea worm occurrence at Adafila. To corroborate the above, the four victims at Kajola were from the households that 'used' their young children to fetch.

Containers used for fetching water were categorised into four covered plastics, uncovered plastics, tin buckets and 'others' including calabash of various sizes.

From the table 3, the highest percentage infection (in parentheses) was recorded in the households that used uncovered plastics, tins and others to fetch water whereas the lowest infection rate was recorded in the households that used covered plastics. The result of the chi-statistics showed that the containers used for fetching also influenced guinea worm infection since dirt could be introduced into drinking water on transit which in turn encourages the survival of the cyclops in the water.

In essence, since the people differ in the containers used for fetching their water and that guinea worm infection varies statistically with the type of containers used to fetch, it follows that the two villages are bound to differ in the levels of guinea worm occurrence.

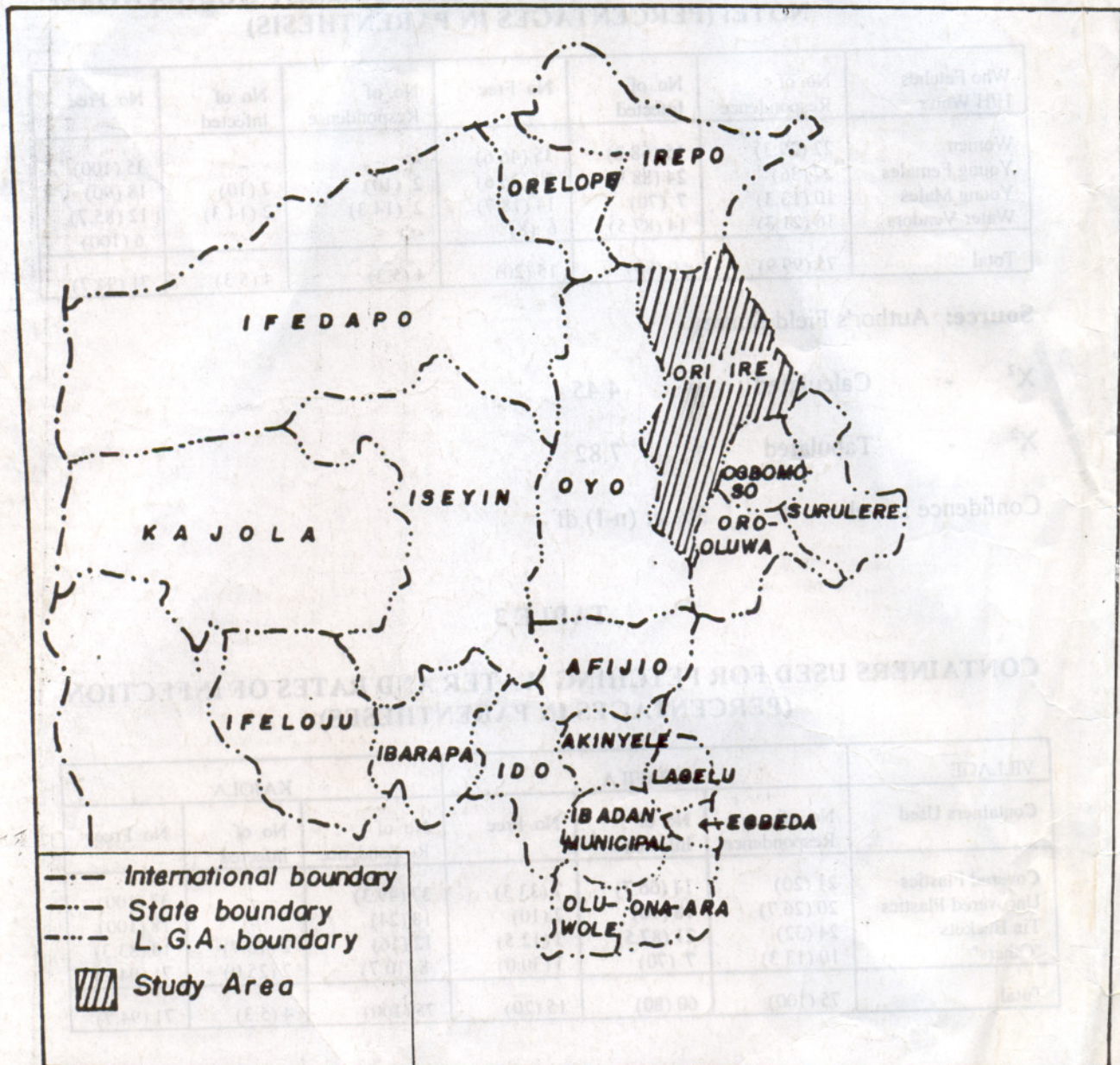


Fig.1: Map of Oyo State showing the Study Area

TABLE 2

**DISTRIBUTION OF HOUSEHOLDS INTO 'WHO FETCHES' THE
HOUSEHOLDS DRINKING WATER AND OCCURENCY GUINEAWORM
NOTE: (PERCENTAGES IN PARENTHESIS)**

Who Fetches H/H Water	No. of Response	No. of Infected	No. Free	No. of Response	No. of Infected	No. Free
Women	22 (29.3)	15 (68.2)	35 (46.6)	- -	- -	35 (100)
Young Females	27 (36)	24 (88.9)	20 (26.6)	2 (10)	2 (10)	18 (90)
Young Males	10 (13.3)	7 (70)	14 (18.7)	2 (14.3)	2 (14.3)	12 (85.7)
Water Vendors	16 (21.3)	14 (87.5)	6 (8)	- -	- -	6 (100)
Total	75 (99.9)	60 (80)	15 (20)	4 (5.3)	4 (5.3)	71 (94.7)

Source: Author's Field Survey

$$X^2 - \text{Calculated} = 4.45$$

$$X^2 - \text{Tabulated} = 7.82$$

$$\text{Confidence Level} = 5\% \text{ at } (n-1) \text{ df}$$

TABLE 3

**CONTAINERS USED FOR FETCHING WATER AND RATES OF INFECTION
(PERCENTAGES IN PARENTHESES)**

VILLAGE	ADAFILA			KAJOLA		
Containers Used	No. of Response	No. of Infected	No. Free	No. of Response	No. of Infected	No. Free
Covered Plastics	21 (20)	14 (66.7)	7 (33.3)	37 (49.3)	-	37 (100)
Uncovered Plastics	20 (26.7)	18 (90)	2 (10)	18 (24)	-	18 (100)
Tin Buckets	24 (32)	21 (87.5)	3 (12.5)	12 (16)	2 (16.7)	10 (83.3)
"Others"	10 (13.3)	7 (70)	3 (30.0)	8 (10.7)	2 (25.0)	71 (94.2)
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