

1 **AGE RELATED PATTERN OF AWARENESS AND BASIC KNOWLEDGE ON ZIKA VIRUS**
2 **DISEASE AMONG WOMEN VISITING CHILDREN IMMUNIZATION UNIT IN ENUGU**
3 **STATE UNIVERSITY TEACHING HOSPITAL, SOUTHEAST NIGERIA**
4

5 ***Original Research Paper***

6 **ABSTRACT**

7 **Background:** Zika virus is an infective agent of significant Public Health importance, which re-
8 emerged in 2015. It is transmitted through mosquito bite, and associated with microcephaly and
9 some other neurological malformations in some babies of infected mothers.

10 **Objectives:** The objective of this study was to assess the age-related pattern of the awareness
11 and basic knowledge of Zika virus infection among women who bring children for immunization,
12 in a teaching hospital, southeast Nigeria.

13 **Materials and Methods:** The study was conducted in the Immunization unit of a Teaching
14 Hospital, Southeast Nigeria, between November 2016 and February 2017. It was a quantitative,
15 observational, descriptive, cross-sectional study, involving randomly selected 256 women who
16 brought children for immunization. Pre-tested, interviewer-administered, structured
17 questionnaire was used; and data was analyzed using SPSS version 20.0 for windows.

18 **Results:** Highest number of respondents [112 (43.8%)] were from 30 to 39 age group, followed
19 by those aged 20 to 29 years [108(42.2%)]. Up to 38.3% of respondents had never heard about
20 Zika virus, though this was not statistically significant when compared to the 61.7% that were
21 aware of Zika Virus Disease ($P = 0.92$). Highest number heard it through television [57(36.1%)].
22 Overall, respondents that were 20 to 29 years of age recorded mean percentage basic
23 knowledge score of 54.6%, while those in the 30 to 39 years age range recorded 49.8%.

24 **Conclusions:** Many respondents either had never heard about Zika virus, and also many
25 exhibited poor basic knowledge on Zika virus disease. It is therefore important to develop good

26 strategies aimed at addressing these awareness and knowledge gaps among women of child-
27 bearing age, who are mostly affected by Zika virus disease.

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31 **Key words:** Age, Awareness, Knowledge, Zika Virus, Women

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34 **ABBREVIATIONS**

Abbreviation	Meaning
ICT	Information and Communication Technology
PCR	Polymerase Chain Reaction
PHEIC	Public Health Emergency of International Concern
RNA	Ribonucleic Acid
TV	Television
WHO	World Health Organization
ZVD	Zika Virus Disease

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43 **1. INTRODUCTION**

44 Zika virus is a flavivirus that re-emerged in 2015 as an infective agent of significant Public
45 Health importance. The virus was first found in monkeys in Uganda, in the year 1947, but later
46 found in humans, in the same Uganda and the United Republic of Tanzania, in 1952 [1]. Mild
47 infections with this virus were recorded in Americas, Asia, Africa, and the Pacific region in the
48 past; but it was in 2015 that it re-emerged in Brazil as a disease of real Public Health
49 importance. It became associated with significant cases of microcephaly in the newborn,
50 Guillian-Barre syndrome in older children and adults, and some other neurological problems in
51 Brazil. Prior to the outbreak in Brazil, the first large outbreak was reported from the Island of
52 Yap (Federated States of Micronesia) in 2007 [1]. As at August 2016, seventy countries
53 reported Zika virus transmission through mosquito bite, out of which twenty of these countries
54 reported association of the infection with microcephaly and other central nervous system
55 malformations [2]. By January 2017, the number of countries reporting mosquito-borne Zika
56 virus transmission had risen to seventy five, with twenty nine reporting association with
57 microcephaly and other neurological problems [3]. In Nigeria, the first reported case of Zika
58 virus infection in man was in Afikpo division, Eastern Nigeria, during the investigation of an
59 epidemic of jaundice in 1952, and reported in 1954. Zika virus was shown to have occurred in
60 three patients, one by isolation of the virus and two by a rise in serum antibodies [4]. Though no
61 confirmed diagnosis of Zika virus disease (ZVD) has been made in Nigeria since then, it is
62 possible that some cases of microcephaly in newborn babies in Nigeria, could have been
63 caused by ZVD [5].

64
65 Zika virus disease is mainly transmitted by infected mosquito bite, usually *Aedes aegypti*, and to
66 a lesser extent *Aedes albopictus* [6]. *Aedes aegypti* also transmits yellow fever, dengue fever,
67 and chikungunya disease [1]. Current evidence show that ZVD could also be transmitted
68 through sexual intercourse, from mother to child, blood transfusion, and laboratory exposure [7].

69 The disease usually presents with mild symptoms such as low grade fever, conjunctivitis,
70 muscle and joint pain, skin rash, headache or malaise; lasting 2 to 7 days [1]. Definitive
71 diagnosis of Zika virus infection is made through Polymerase Chain Reaction (PCR), and virus
72 isolation from the blood [8]. There is currently no specific drug used for the treatment of ZVD.
73 Treatment usually comprises sufficient rest and managing the symptoms. There is also no
74 vaccine currently available for prevention of the infection [8]. As a result of the disease outbreak
75 in Brazil 2015, which resulted in a cluster of microcephaly cases and other neurological
76 disorders, following a similar cluster in French Polynesia in 2014; WHO on February 1, 2016
77 declared Zika virus infection a "Public Health Emergency of International Concern (PHEIC)" [9].
78 This was aimed at emphasizing the urgent need aimed at creating more awareness about the
79 disease, and mobilizing international support needed for the control of the infection.

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81 This viral infection can be controlled through environmental activities aimed at controlling
82 mosquito population, and protecting humans, especially pregnant women from mosquito bite.
83 Safer sex practices for six months, especially for men and women returning from areas of active
84 transmission is also a recommended ZVD prevention method [1]. It has been document that
85 Zika virus RNA was detected in semen up to 188 days following onset of symptoms, and
86 infectious virus was found in the semen 69 days after the onset of symptoms [10]. It is important
87 therefore, that men who suffered from ZVD abstain from sex, or practice safer sex for this
88 duration of time.

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90 Though WHO declared an end to its global health emergency (PHEIC) on Zika virus in
91 November, 2016; she still maintained that the infection is a dangerous mosquito-borne disease
92 like malaria or yellow fever, and as such should be viewed as an ongoing threat. WHO
93 emphasized that the crisis was not yet over [11]. Most mothers visiting children immunization
94 unit in any hospital are usually those that bring their children for immunization against vaccine

95 preventable diseases. Children who have microcephaly, or any other form of congenital
96 malformation are usually identifiable at this stage. It is therefore important that the awareness
97 and knowledge of Zika virus infection among this group is assessed; with the aim of identifying
98 gaps, and developing interventions to address the identified gaps. It is possible that age of the
99 woman that is the caregiver of the child might be a factor that affects the level of knowledge
100 exhibited by the female caregivers. The primary objective of this study was to assess the age-
101 related pattern of the awareness and basic knowledge of Zika virus infection among women
102 who bring children for immunization, in a teaching hospital, Southeast Nigeria.

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106 **2. MATERIALS AND METHODS**

107 **2.1. Study Area:** Nigeria is the most populous country in Africa, and administratively is divided
108 into thirty six states and the federal capital territory, which are further split into a total of seven
109 hundred and seventy four local government areas [12]. Enugu state is one of the five states in
110 the Southeast geo-political zone of the country, and it has seventeen local government areas
111 [13]. The state has four public tertiary health facilities, with two being designated teaching
112 hospitals; one owned by the federal government, while our study site is owned by the state
113 government. Hospital records revealed that this state teaching hospital usually conducts
114 immunization activity three times in a week; Mondays, Wednesdays, and Fridays. On the
115 average, 263 children are immunized weekly.

116 **2.2. Study Design:** The study was quantitative study; and was of observational, descriptive,
117 cross-sectional design.

118 **2.3. Study Population:** The study was conducted among women who brought children for
119 immunization in the Enugu State University Teaching Hospital. All female care givers that
120 brought children to the immunization unit within the study period were included in the study,

121 while very few male care givers that brought children for immunization were excluded from the
122 study. Other care givers and health workers who brought children to the hospital for purposes
123 outside immunization were also excluded from the study.

124 **2.4. Sampling instrument:** Pre-tested questionnaire that was divided into sections on socio-
125 demographic variables, awareness of Zika virus disease, and basic knowledge of Zika virus
126 infection; was used for data collection.

127 **2.5. Sample selection and data collection:** The respondents were recruited into the study
128 through random sampling of women who brought their children for immunization on each of the
129 stated immunization days. Ten of these women were interviewed on each immunization day by
130 a trained junior resident doctor in the department of Community Medicine, of the study teaching
131 hospital, giving a total of thirty interviewed in one week. This process was conducted for nine
132 weeks between November 2016, and February 2017, with only sixteen interviewed on the ninth
133 week. A total of two hundred and fifty six (256) respondents were interviewed. Data were also
134 simultaneously collected from the same respondents for other ZVD studies.

135 **2.6. Data analysis:** The information gathered were analyzed using SPSS version 20.0 for
136 windows. The outcome measures were expressed in terms of frequency and percentage of
137 respondents who were aware of ZVD, and those who had correct basic knowledge of the virus.
138 The results were presented in tables and figure.

139 **2.7. Ethical Consideration:** Ethical clearance for the study was obtained from the Ethical
140 Research Committee of the Enugu State University College of Medicine, and informed consent
141 was obtained from each respondent, prior to commencement of the interview.

142 **2.8. Limitation:** There were marked differences in the number of respondents in some of the
143 age groups that were assessed. Most of the respondents were between 20 to 39 years of age
144 (86.0%); with 42.2% being 20 to 29 years of age, and 43.8% being 30 to 39 years. Thus,
145 findings among the other age groups that were 40 years and above, or 19 years and below
146 could not be reliably compared with those that were 20 to 39 years of age. A study with equal or

147 close number of respondents in each age group, could reveal more reliable findings on the age-
 148 related pattern of awareness and basic knowledge on Zika virus disease among the study
 149 population.

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153 **3. RESULTS**

154 **3.1. Socio-Demographic characteristics:** Most of the respondents were within the age range
 155 of 20 - 39 years (86.0%), with highest number [112 (43.8%)] being 30 to 39 years of age, and
 156 then those aged 20 to 29 years [108(42.2%)]; while 8.2% were between the age range of 40 -
 157 49 years, 3.5% below 19 years, 1.2% 50 - 59 years, 0.8% between 60 - 69 years, only one
 158 person (0.4%) was above 70 years of age. Most were Igbo by tribe (92.2%), married (89.5%),
 159 mostly Christians (94.9%), and graduates of a tertiary education institution (50.4%). Almost half
 160 of the respondents were civil servants (48.4%), followed by Petty traders (15.2%).

161

162 Table 1: Socio-Demographic Characteristics

163 Socio-Demographic Variable	164 N	165 %
	(256)	(100)
166 Age Range (yrs)		
166 19 and below	9	3.5
167 20 – 29	108	42.2
168 30 – 39	112	43.8
169 40 – 49	21	8.2
170 50 – 59	3	1.2
171 60 – 69	2	0.8
172 70 and above	1	0.4

173			
174	Tribe		
175	Igbo	236	92.2
176	Efik	1	0.4
177	Yoruba	6	2.3
178	Hausa	8	3.1
179	Igala	1	0.4
180	Cross Rivers	1	0.4
181	Benue	2	0.8
182	West Country	1	0.4
183			
184			
185	Marital Status		
186	Married	229	89.5
187	Single	26	10.2
188	Divorced/Separated	1	0.4
189			
190	Religion		
191	Christian	243	94.9
192	Muslim	8	3.1
193	Traditional Religion	5	2.0
194			
195	Educational Level		
196	No Formal Education	3	1.2
197	Primary Level	5	2.0
198	Secondary Level	65	25.4

199	Tertiary Level	129	50.4
200	Postgraduate Level	54	21.1
201			
202	Occupation		
203	Applicant	5	2.0
204	Farmer	6	2.3
205	Teacher	21	8.2
206	Petty Trader	39	15.2
207	Civil Servant	124	48.4
208	Public Servant	7	2.7
209	Student	29	11.3
210	National Youth Service Corps	2	0.8
211	Business	7	2.7
212	Hair Dressing	1	0.4
213	Engineer	2	0.8
214	Tailoring/Fashion Designer	3	1.2
215	Banking	1	0.4
216	Optometrist	1	0.4
217	Private Organization	7	2.7
218	Nursing	1	0.4

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220 **3.2. Awareness of Zika Virus:** Between the age range of 20 - 49 years, respondents within all
 221 the age intervals documented recorded awareness score above 60%. Those that were 30 - 39
 222 years had the highest percentage awareness score of 63.4%. Those within 20 - 29 years and 40
 223 - 49 years had almost the same score (61.1% and 61.9% respectively). Respondents less than
 224 19 years of age were only 9 (3.5% of the total number of respondents in the study), out of which

225 5 (55.6%) were aware of Zika virus. Respondents above 50 years of age were even fewer (6
 226 [2.3%]), out of which 3 (50%) were aware of Zika virus. Overall, 61.7% of respondents are
 227 aware of ZVD, while 38.3% were not aware.

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229 Table 2: Respondents that ever heard about Zika virus

Age	Yes	No	Total
Less than 19	5 (55.6%)	4 (44.4%)	9 (100.0%)
20 - 29	66 (61.1%)	42 (38.9%)	108 (100.0%)
30 - 39	71 (63.4%)	41 (36.6%)	112 (100.0%)
40 - 49	13 (61.9%)	8 (38.1%)	21 (100.0%)
50 - 59	2 (66.7%)	1 (33.3%)	3 (100.0%)
60 - 69	1 (50.0%)	1 (50.0%)	2 (100.0%)
70 and above	0 (0.0%)	1 (100.0%)	1 (100.0%)
Total	158 (61.7%)	98 (38.3%)	256 (100.0%)
P-value	0.915		

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232 **3.3. Source of Zika virus information:** More respondents accessed information on Zika virus
 233 through the Television (36.1%). This was followed by 23.4% for Radio, 13.9% for Newspaper,
 234 7% respectively through friend or hospital, 5.1% through school, 4.4% through internet, 1,3%
 235 respectively through relation and church, and 0.6% through market.

236 Table 3: Source of Zika virus information

Age	Radio	TV	Newspaper	Relations	Friends	Church	School	Market	Internet	Hospital	Total
< 19	0 (0.0%)	2 (40.0%)	2 (40.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (100%)
20 - 29	17 (25.8%)	19 (28.8%)	9 (13.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (12.1%)	0 (0.0%)	6 (9.1%)	7 (10.6%)	66 (100%)
30 - 39	14 (19.2%)	32 (46.6%)	9 (12.3%)	2 (2.7%)	8 (11.0%)	2 (2.7%)	0 (0.0%)	1 (1.3%)	1 (1.3%)	2 (2.7%)	71 (100%)
40 - 49	4 (30.8%)	3 (23.1%)	2 (15.4%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (15.4%)	13 (100%)
50 - 59	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100%)
60 - 69	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100%)
70 & above	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	37 (23.4%)	57 (36.1%)	22 (13.9%)	2 (1.3%)	11 (7.0%)	2 (1.3%)	8 (5.1%)	1 (0.6%)	7 (4.4%)	11 (7.0%)	158 (100%)

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242 **3.4. Basic knowledge on Zika virus infection:** Overall correct knowledge of respondents that
243 Zika virus disease symptoms could be similar to those for malaria was 61.3%. Respondents
244 within 20 - 29 and 50 -59 age range respectively recorded percentage knowledge of 66.7%
245 among respondents in their groups. They were followed by respondents within the age range of
246 30 -39 (59.8%). Out of the 9 respondents that were 19 years of age and bellow, 5(55.6%) had
247 the correct knowledge, while only one person out of the two within 60 - 69 years had the correct
248 knowledge. Most of the respondents (75.4%) knew that Zika virus is micro-organism that you
249 cannot see with the naked eyes. Among the two groups that constituted 86.0% of respondents,
250 the highest percentage knowledge on this was demonstrated by respondents between the age
251 range of 20 - 29 years (75.9%), while those between 30 -39 years scored 74.1%. Six (66.7%),
252 out of the nine respondents that were 19 years of age and below had this knowledge while two
253 (66.7%), out of the three between 50 - 59 years had the knowledge. All the two
254 respondents(100%) between 60 - 69 years had the knowledge, but the only respondent that
255 was 70 years or above did not know that Zika virus is a micro-organism that cannot be seen
256 with the naked eye. The knowledge that Zika virus could infect monkeys was very poor among
257 respondents. The overall score was 39.1%, while respondents in age range of 20 - 29 years
258 scored 40.7%, and those between 30 and 39 years scored 40.2%. The only respondent that
259 was 70 years of age or above had the correct knowledge, while none of them between the ages
260 of 50 to 69 years had the correct knowledge. The knowledge of Zika virus being transmitted
261 through mosquito bite was reasonably high among respondents between the ages of 20 to 29
262 years (74.1%), but not so high among those between the ages of 30 to 39 years (59.8%). Those
263 between the ages of 40 to 49 years recorded 52.4%, two respondents (66.7%) out of the three
264 between the ages of 50 to 59 years had the correct knowledge on this, while none of the two
265 persons between the ages of 60 to 69 had the correct knowledge. The only respondent that was
266 70 years or above had the correct knowledge. The overall knowledge level on Zika virus being
267 transmitted through mosquito bite was 65.6%

268

269 Respondent between 30 to 39 years of age demonstrated slightly higher knowledge level
270 (46.4%) than respondents between the ages of 20 to 29 who recorded 44.4%, on Zika virus
271 being transmitted through sexual intercourse. Those between 40 to 49 years scored 28.6%,
272 while those 19 years or below scored 22.2%. Only one person (33.3%) out of three between 50
273 to 59 years knew about sexual transmission, while none of the two between 60 to 69 years had
274 the correct knowledge. The only one person that was 70 years or above had the correct
275 knowledge. The overall knowledge level on this was 43.0%. The knowledge level among
276 respondents between 30 to 39 years that Zika virus could be transmitted through blood
277 transfusion was 51.8%, between 20 to 29 years was 50.0%, and between 40 to 49 years was
278 23.8%. Only two (22.2%) out of nine respondents 19 years and below had the correct
279 knowledge, 2 (66.7%) out of the 3 respondents between 50 to 59 years also had the correct
280 knowledge while none of those between 60 to 69 years had the correct knowledge. The only
281 one person that was 70 years of age or above had the correct knowledge. The overall
282 knowledge level on Zika virus being transmitted through blood transfusion was 47.7%.

283

284 About half of the respondents between the ages 20 to 29 years (50.9%) knew that Zika virus
285 cannot be transmitted through rat bit. Between the ages of 30 to 39 years, and 40 to 49 years
286 age range, 44.5%, and 42.9% respectively had the correct knowledge. Three (33.3%) out of the
287 nine respondents that were below the age of 19 had the correct knowledge, while none of the
288 three respondents 60 years and above had the correct knowledge. Two (66.7%) persons out of
289 the three between 50 to 59 years of age had the correct knowledge that Zika virus is not
290 transmitted through rat bite. Good percentage of respondents between 20 to 29 years of age
291 (62.0%) knew that Zika virus is not transmitted through shaking of hands with an infected
292 person, while 50.9% of those between 30 to 39 years of age, and 47.6% of those between 40 to
293 49 years had the correct knowledge. All the two respondents between 60 to 69 years of age,

294 and one person (33.3%) out of the three between 50 to 59 years had the correct knowledge.
295 Four (44.4%) out of the nine respondents that were 19 years of age and below had the correct
296 knowledge, while the one person 70 years of age or above did not know that Zika virus cannot
297 be transmitted through shaking of hands with infected person. Again respondents between the
298 ages of 20 - 29 years had the highest knowledge score (66.7%) on Zika virus not being
299 transmitted through sharing of meals with infected person. They were followed by those
300 between 30 to 39 years (51.8%), and 40 - 49 (47.6%). Few of those that were 19 years and
301 below (33.3%), one person out of the three that were 50 to 59 years of age (33.3%), and all the
302 2 persons between 60 to 69. The one person 70 years of age and did not have this knowledge.
303 Overall, 56.6% of respondents knew that Zika virus infection could not be transmitted through
304 sharing of meals with an infected person.

305
306 Seven, out of the nine respondents that were 19 years and less (77.8%) knew that Zika virus
307 infection in a pregnant woman could lead to delivery of baby with malformed brain, while 65.7%
308 of those between 20 to 29 years of age, 56.3% of those between 30 to 39 years, and 52.4% of
309 those between 40 to 49 years had the same knowledge. None of the 5 respondents from 50 to
310 69 years of age knew that Zika virus infection could lead to delivery of baby with malformed
311 brain, while the only respondent that was 70 years and above had the knowledge. Overall,
312 59.8% of respondents had the correct knowledge that Zika virus infection in a pregnant woman
313 could lead to delivery of a baby with malformed brain. On Zika virus infection not resulting in the
314 delivery of a very big baby, 57.4% of respondents that were 20 to 29 years of age, 45.5% of
315 those 30 to 39 years and 38.1% of those that were 40 to 49 years had the knowledge. Three
316 (33.3%) of the nine persons that were 19 years and less, two out of the three persons 50 to 59
317 years, and the only one person that was 70 years and above knew that Zika virus infection in a
318 pregnant woman does not result in the delivery of very big baby. None of the two respondents
319 that were 60 to 69 years had the correct knowledge. A total of 127 (49.6%) of respondent knew

320 that Zika virus infection did not result in the delivery of very big baby. None of the respondents
321 aged 50 and above knew that Zika virus infection could result in the delivery of baby with small
322 head, while 45.4%, 47.3% and 47.6% of respondents aged 20 to 29, 30 to 39, and 40 to 49
323 years respectively had the correct knowledge. Three (33.3%) out of the nine respondents aged
324 19 years and less also had the correct knowledge. The Overall correct knowledge on Zika virus
325 infection in pregnant women causing delivery of babies with small head was 44.9%. Again, none
326 of the respondents aged 50 years and above knew that Zika virus infection in adult human could
327 lead to paralysis, while 38.9%, 37.5%, and 33.3% of respondents 20 - 29 years, 30 -39 years,
328 and 40 - 49 years respectively had the correct knowledge on the issue. Three (33.3%), out of
329 the nine respondents aged 19 years and below, that participated had the correct knowledge.
330 The overall correct knowledge on this was 36.7%. On the question of Zika virus infection in an
331 adult not resulting in the shrinking of the head, respondents that are 30 to 39 years of age
332 scored 40.2%, followed by those 20 to 29 years (38.9%), and 40 to 49 years (38.1%). No
333 respondent 60 years and above gave the correct response, while only one person out of the
334 nine that were 19 years and below (11.1%), and also one person out of the three that were 50 to
335 59 years (33.3%) gave the correct response. Overall, 37.9% of the respondents knew that Zika
336 virus infection does not lead to shrinking of the head in the infected adult. Less than half of
337 respondents 20 - 29 years of age (41.7%), and 30 - 39 years (41.1%) knew that there is no
338 vaccine for Zika virus infection. Only one person among the nine that were 19 years and below
339 (11.1%), and four out of the twenty one that were 40 - 49 years of age had the correct
340 knowledge. None of the six respondents that were 50 years and above knew that Zika virus
341 infection does not have any preventive vaccine. Overall score of the respondents on this
342 knowledge score was 37.5%.

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346 Table 4: Basic knowledge on Zika virus infection

Question	Age range (Years)	Correct Response
Zika virus Disease symptoms can be similar to those for malaria?	19 and less	5 (55.6%)
	20 - 29	72 (66.7%)
	30 - 39	67 (59.8%)
	40 - 49	10 (47.6%)
	50 - 59	2 (66.7%)
	60 - 69	1 (50.0%)
	70 and above	0 (0.0%)
	Total	157 (61.3%)
Zika virus is micro-organism that you cannot see with the naked eyes?	19 and less	6 (66.7%)
	20 - 29	82 (75.9%)
	30 - 39	83 (74.1%)
	40 - 49	18 (85.7%)
	50 - 59	2 (66.7%)
	60 - 69	2 (100.0%)
	70 and above	0 (0.0%)
	Total	193 (75.4%)
Zika virus can infect monkeys?	19 and less	3 (33.3%)
	20 - 29	44 (40.7%)
	30 - 39	45 (40.2%)
	40 - 49	7 (33.3%)
	50 - 59	0 (0.0%)

	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	100 (39.1%)
Zika virus can be transmitted through mosquito bite?		
	19 and less	7 (77.8%)
	20 - 29	80 (74.1%)
	30 - 39	67 (59.8%)
	40 - 49	11 (52.4%)
	50 - 59	2 (66.7%)
	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	168 (65.6%)
Zika virus can be transmitted through sexual intercourse?		
	19 and less	2 (22.2%)
	20 - 29	48 (44.4%)
	30 - 39	52 (46.4%)
	40 - 49	6 (28.6%)
	50 - 59	1 (33.3%)
	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	110 (43.0%)
Zika virus can be transmitted through blood transfusion?		
	19 and less	2 (22.2%)
	20 - 29	54 (50.0%)
	30 - 39	58 (51.8%)

	40 - 49	5 (23.8%)
	50 - 59	2 (66.7%)
	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	122 (47.7%)
Zika virus can be transmitted through rat bite?		
	19 and less	3 (33.3%)
	20 - 29	55 (50.9%)
	30 - 39	50 (44.6%)
	40 - 49	9 (42.9%)
	50 - 59	2 (66.7%)
	60 - 69	0 (0.0%)
	70 and above	0 (0.0%)
	Total	119 (46.5%)
Zika virus can be transmitted through shaking hands with infected persons?		
	19 and less	4 (44.4%)
	20 - 29	67 (62.0%)
	30 - 39	57 (50.9%)
	40 - 49	10 (47.6%)
	50 - 59	1 (33.3%)
	60 - 69	2 (100.0%)
	70 and above	0 (0.0%)
	Total	141 (55.1%)
Zika virus can be transmitted through sharing meal		
	19 and less	3 (33.3%)

with an infected person?	20 - 29	72 (66.7%)
	30 - 39	58 (51.8%)
	40 - 49	10 (47.6%)
	50 - 59	1 (33.3%)
	60 - 69	1 (50.0%)
	70 and above	0 (0.0%)
	Total	145 (56.6%)
Zika virus can infect a pregnant woman leading to the delivery of a baby with malformed brain?	19 and less	7 (77.8%)
	20 - 29	71 (65.7%)
	30 - 39	63 (56.3%)
	40 - 49	11 (52.4%)
	50 - 59	0 (0.0%)
	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	153 (59.8%)
Zika virus can infect a pregnant woman leading to the delivery of a very big baby?	19 and less	3 (33.3%)
	20 - 29	62 (57.4%)
	30 - 39	51 (45.5%)
	40 - 49	8 (38.1%)
	50 - 59	2 (66.7%)
	60 - 69	0 (0.0%)
	70 and above	1 (100.0%)
	Total	127 (49.6%)

Zika virus can infect a pregnant woman leading to the delivery of a baby with small head (Microcephaly)?	19 and less	3 (33.3%)
	20 - 29	49 (45.4%)
	30 - 39	53 (47.3%)
	40 - 49	10 (47.6%)
	50 - 59	0 (0.0%)
	60 - 69	0 (0.0%)
	70 and above	0 (0.0%)
	Total	115 (44.9%)
Zika virus can infect a grown-up person, leading to paralysis?	19 and less	3 (33.3%)
	20 - 29	42 (38.9%)
	30 - 39	42 (37.5%)
	40 - 49	7 (33.3%)
	50 - 59	0 (0.0%)
	60 - 69	0 (0.0%)
	70 and above	0 (0.0%)
	Total	94 (36.7%)
Zika virus can infect a grown-up person, leading to shrinking of the head?	19 and less	1 (11.1%)
	20 - 29	42 (38.9%)
	30 - 39	45 (40.2%)
	40 - 49	8 (38.1%)
	50 - 59	1 (33.3%)
	60 - 69	0 (0.0%)

	70 and above	0 (0.0%)
	Total	97 (37.9%)
Zika virus has a vaccine for the prevention of infection	19 and less	1 (11.1%)
	20 - 29	45 (41.7%)
	30 - 39	46 (41.1%)
	40 - 49	4 (19.0%)
	50 - 59	0 (0.0%)
	60 - 69	0 (0.0%)
	70 and above	0 (0.0%)
	Total	96 (37.5%)

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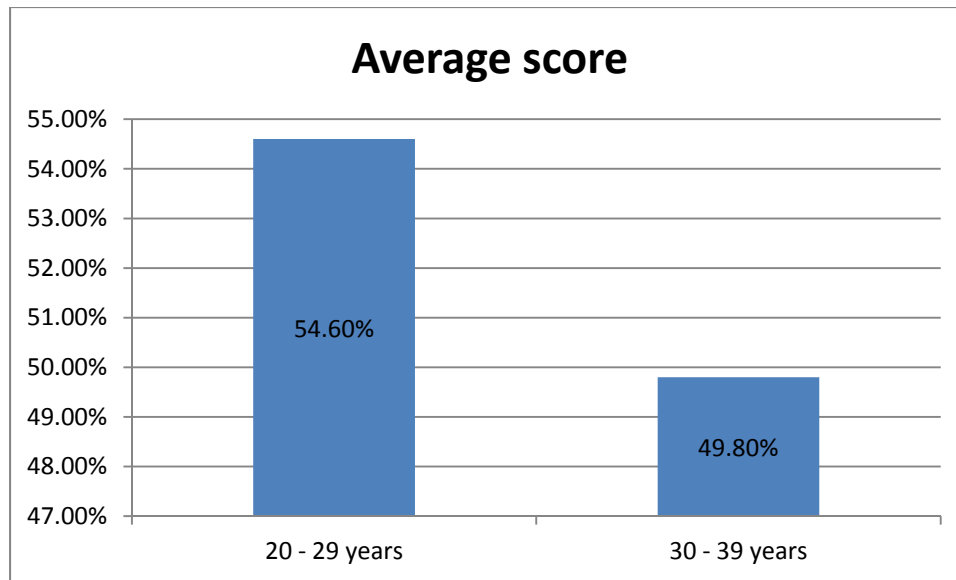
349

350 **3.5. Mean Percentage Basic Knowledge score of Respondents in 20 - 29, and 30 - 39 age**

351 **groups:** Respondents that fell within the age range of 20 to 29 years recorded higher scores in
 352 eleven, out of the fifteen Zika virus knowledge questions that respondents were required to
 353 provide answers to, while those that are 30 to 39 years of age, scored highest in four out of the
 354 fifteen basic knowledge questions posed. Overall, respondents 20 to 29 years of age, recorded
 355 mean percentage basic knowledge score of 54.6%, while those in the 30 to 39 years age range
 356 recorded 49.8%.

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360 Fig 1: Mean percentage Basic knowledge score of respondents aged 20 to 29, and those aged 30 to 39
 361 years

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364 **4. DISCUSSION**

365 Simply comparing the age related pattern of awareness and basic knowledge on Zika virus
 366 disease among respondents in this study, as recorded in the nine age groups presented in the
 367 result section could be misleading. Very clear majority of respondents in this study were aged
 368 20 to 39 years (86.0%), with almost equal number falling into the age range of 20 to 29 years
 369 (42.2%), and 30 to 39 years (43.8%). The closest number to 20 - 29 and 30 - 39 years groups of
 370 respondents in any age group that participated in this study were those aged 40 to 49 years
 371 (8.2%), while the group with the next number of respondents fell into those that were 19 years
 372 and below (3.5%). Only six (2.4%) of the respondents were 50 years and above [Table 1].

373 Hence, it is obvious that reliable comparison of the findings in the various age groups could only
 374 be made among those that were 20 to 29 years, and 30 to 39 years. This as previously stated is
 375 a limitation in this study. The study population comprising of women who brought their children
 376 for immunization implies that most would be within the reproductive age range of 15 to 49 years.

377

378 Among the different age groups of ten years each, respondents belonging to age groups 20 - 29
379 years, 30 - 39 years, and 40 - 49 years; recorded very close awareness percentage scores of
380 61.1%, 63.4%, and 61.9% respectively. These scores also are not remarkably different from the
381 overall awareness score of 61.7%, since 94.1% of all the respondents fell into those aged 20 to
382 49 years [Table 2]. The highest percentage of respondents that heard about Zika virus got the
383 information through the television (36.1%), with most of those aged 39 years and above
384 accessing the information through the television, while most of those that were 40 years and
385 above got the information through the radio [Table 3]. This could be seen as strengthening the
386 thinking that radio, possibly might not be the current most effective means of disseminating
387 health information among the younger generation in urban areas; rather television could achieve
388 better results in health information dissemination among this group. It was also found in a Zika
389 virus knowledge and perception study in an education city in Qatar that Television (42.8%) was
390 a reasonably more popular source of Zika virus information when compared to Radio (10.8%)
391 [14]. Most of the respondents in the Qatar study were 39 years and below (77.6%), which could
392 be compared to the 89.5% of respondents in this study that were aged 39 years and below.
393 Television being the most popular source of health information probably would not apply in the
394 rural areas where ownership of Television sets and availability of electricity are still problematic.
395 However, it was found in the Outpatient department of an urban tertiary hospital, Northeast
396 Nigeria, that Radio was a reasonably better source of Zika virus information among
397 reproductive-age women (47.7%), than Television (11.2%) [15]. It is said that most of the
398 patients who access health from the Outpatient department of that hospital in the Northeastern
399 part of Nigeria, came from the hinterlands; hence radio was still commonly used by majority of
400 the respondents in that study. Further comparing the source of Zika virus information in this
401 study with the earlier stated Qatar study, revealed that whereas Internet was the leading source
402 of Zika virus information among the Qatar respondents (60.8%), it was the third to the least

403 source (4.4%) among ten options in our study; performing only better than Market and Church
404 as sources of Zika virus information. This very poor score of Internet as a source of Zika virus
405 information in this study, could be a pointer to low computer literacy and
406 Information/Communication Technology (ICT) use among our respondents. Low Internet Zika
407 virus information source (6.9%) was also documented in the Northeast Nigeria study [15].

408
409 Respondents aged 20 to 29 years of age demonstrated better basic knowledge on Zika virus, in
410 eleven out of the fifteen questions that were posed to respondents; when compared to those
411 aged 30 to 39 years of age that were better in only four questions [Table 4]. These younger
412 respondents were eventually able to demonstrate fairly good mean basic knowledge on Zika
413 virus (54.6%), while those aged 30 to 39 years recorded slightly less than average score
414 (49.8%) [Fig. 1]. This finding could be said to compare well with the finding in another Zika virus
415 knowledge study among women of reproductive age in Northern Nigeria, where women aged
416 less than 27 years demonstrated superior Zika virus knowledge than those aged 27 years and
417 above [15]. Certain factors could have contributed to the younger respondents having better
418 knowledge than the older ones. These factors could have been said to include the likelihood of
419 these younger ones having more interest in watching Television since TV was recorded to be
420 the most common source of Zika virus information in this study. On Television being the source
421 of ZVD information, the younger ones however scored less than those aged 30 - 39 years.
422 Another plausible reason could be that the younger respondents were still probably students,
423 thus could be more exposed to health information in school, than the older respondents. These
424 lines of thought however require further scientific research.

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428

429 **5. CONCLUSION**

430 WHO declared Zika virus infection a "Public Health Emergency of International Concern" on
431 February 1, 2016, but lifted the emergency declaration in November of the same year. She
432 however cautioned that the potential of the virus posing future public health challenges was not
433 over. It is therefore very wise to still work towards identifying awareness and knowledge gaps
434 among key members of the society that are mostly affected by the Zika virus infection, with the
435 aim of addressing these gaps and preventing the health hazards associated with the virus.
436 Among respondents within the child bearing age group, only those within the age range of 20 to
437 29 recorded mean percentage basic knowledge score that was over 50.0% (54.6%). It is then of
438 utmost importance that health managers in the study state articulate strategy that will be
439 implemented, towards addressing the identified awareness and knowledge gaps in this study.

440

441

442 **6. COMPETING INTERESTS**

443 The Authors hereby declare that there was no conflict of interest during this research work, and
444 preparation of this paper.

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UNDER PEER REVIEW