

Original Research Article

Awareness and Status of Tetanus Toxoid Immunization among Female Undergraduate Students in a Nigerian University.

ABSTRACT

Aims: The study aimed to determine the level of awareness and status of tetanus toxoid (TT) vaccination among female undergraduates in Port Harcourt.

Study design: This was a cross sectional descriptive study carried out among female undergraduate students.

Place and Duration of Study: The study was carried out in University of Port Harcourt from 1st to 31st of May 2014.

Methodology: A pre-tested questionnaire was administered to 512 female students selected through a Multi-Staged sampling technique. Information sought included socio-demographics, awareness of TT vaccine, knowledge of the vaccination campaign for women of childbearing age and TT vaccination status. Data was analyzed using epi info version 7.1.3.3.

Results: A total of 512 students participated in the study; mean age was 22± 2.79 years. Four hundred and eighty five (94.7%) and 409 (79.9%) students had heard of tetanus and TT vaccine respectively. Commonest sources of information were health workers. 33.8% knew the target population for the TT vaccination campaign and 18.2% knew that the correct number of doses of TT is 5 doses. Two hundred and ninety eight (58.2%) and 10 (2%) students had received at least 1 dose and 5 doses of TT respectively. Students who had knowledge of the target population for TT vaccination campaign (OR=2.1362, p=0.003) and those who were confident in the effectiveness of TT (OR=2.4074, p=0.000) were twice more likely to receive at least a dose of TT vaccine.

Conclusion: There was poor knowledge of TT vaccination campaign for women of childbearing age and very poor coverage of TT5 among the female undergraduate students in Port Harcourt. Female undergraduate students should be reached during TT vaccination campaigns.

Keywords: [Tetanus toxoid, Female undergraduates, Students, Port Harcourt]

18 **1. INTRODUCTION**

19 Maternal and neonatal tetanus (MNT) is a public health problem which has continued to
20 plague most countries in the developing world, despite the availability of an effective vaccine
21 [1]. Tetanus is an acute, infectious, non-communicable disease with a high case fatality rate,
22 Caused by *Clostridium tetani* [2]. The World Health Organization reported that globally,
23 49,000 newborns died of this disease in 2013 alone [1]. Tetanus kills one newborn every
24 eleven minute or approximately 134 babies every day [3]. A significant number of women
25 also die every year due to maternal tetanus [1]. Most of these deaths occur in Africa and in
26 East and Southern Asia among populations with limited or no access to health care services
27 and information related to safe birthing practices, with poor socio-economic status and low
28 literacy rate [1].

29 Due to international and regional efforts which were directed at eliminating maternal and
30 neonatal tetanus, 35 countries were certified free of the disease between 2000 and June
31 2014 [1,3]. However, maternal and neonatal tetanus still remains a public health threat in 24
32 countries including Nigeria [4,5,6,7,8]. In one study done in Nigeria, neonatal tetanus
33 accounted for 20.9% of the total neonatal deaths recorded [9].

34 The major predisposition to this disease is lack of maternal vaccination with Tetanus Toxoid
35 vaccine, coupled with deliveries conducted by untrained caregivers in an unhygienic
36 environment and with unhygienic birth practices [1,4]. These conditions allow the tetanus
37 spores to contaminate maternal wounds during child birth and the umbilical cord at the time
38 it is cut or dressed after delivery [1,2,4].

39 The major means of preventing maternal and neonatal tetanus recommended by WHO is
40 the vaccination of women of childbearing age (15 to 49 years) with 5 doses of tetanus toxoid
41 vaccine as early as possible [1,10,11]. The vaccine schedule is as follows: First dose (TT1)
42 is to be administered at first contact, 2nd dose (TT2) at 4 weeks after the first dose, TT3 6
43 months after TT2, TT4 1 year after TT3 and TT5 is given 1 year after TT4 [10]. The complete
44 5 doses is expected to provide lifelong protection for the would be mother and also provide

adequate partial immunity for her unborn baby against neonatal tetanus [1]. Available data showed that the uptake of the vaccine by women of childbearing age in Nigeria has been poor.[12,13]. As part of the strategy to enhance the uptake of the vaccine in Rivers State, three phases of maternal and neonatal tetanus elimination campaign targeted at women of child bearing age were launched in Rivers State from 2009 to 2010 [14]. Following these numerous campaigns which had been carried out in Rivers State, this present study therefore aimed to assess the level of awareness and status of tetanus toxoid vaccination among female undergraduates in Port Harcourt.

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57 2. MATERIAL AND METHODS

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59 This was a descriptive cross-sectional study carried out among female undergraduate students of the University of Port Harcourt from 1st to 31st of May 2014. The University of Port Harcourt is the largest Federal tertiary institution in Rivers State, Southern Nigeria. Records show that as at the 2013 / 2014 session, there were 11,526 male and 9,674 female regular undergraduate students.

64 The sample size for this study was calculated using the formula [15] for estimating minimum sample size for descriptive studies when studying proportions with an entire population size < 10 000 using a population size of 9,674 female students in the University

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$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

70 Where:

71
72

$$n_0 = \frac{Z^2(pq)}{E^2}$$

73 n = minimum sample size

74 p= Prevalence of 46.7% reported by Bamidele and Umoh [16]

75 q= 100 – p

76 E= Margin of error tolerated at 5%

77 Z= 1.96 at 95% confidence level

78
$$n_0 = \frac{1.96^2 \times 46.7 \times (100-46.7)}{5^2} = 382$$

80
$$n = \frac{382}{1 + \frac{382 - 1}{9,674}}$$

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84 Thus minimum sample size of 368 was calculated.

85 Allowance for attrition (30%) = 115

86 Minimum sample size = 368 + 115 = 483

87 However 560 questionnaires were distributed to students that were recruited for the study. A
88 multi – staged sampling technique was used to recruit the students. The students were first
89 stratified into the eight major Faculties and Colleges of the University and the total number of
90 female students in each faculty or college was determined from the school records. One
91 department was randomly chosen from each of the eight faculties / colleges. From the
92 chosen departments, an academic grade level was chosen by simple random sampling
93 technique. According to the proportion of female students in each faculty or college, a
94 specific number of female students were selected by simple random technique. In faculties
95 or colleges where the selected grade level did not have sufficient number of females
96 required for that faculty, a second grade level was chosen by simple random sampling
97 technique to complete the process of randomly selecting female students for that faculty.
98 However 12 (2.1%) students did not give consent, another 36 (6.4%) did not return their
99 questionnaires and were excluded from the study. Eventually 512 students participated in
100 the study.

101 The questionnaire used for the study was designed by the researchers and it was reviewed
102 by a panel of specialist Paediatric consultants to ascertain the face validity. It was structured;
103 self-administered and pretested by administering it to 40 students in a department not

104 included in the study, after which ambiguous questions were removed or modified.
105 Information sought included socio-demographics, awareness of tetanus and tetanus toxoid
106 (TT) and vaccination status.

107 Data was analyzed using the Epi Info version 7.1.3.3 (CDC, Atlanta Georgia, USA) statistical
108 software. Bivariate analysis involved the use of Chi-Square for testing the significance of
109 associations between categorical variables. Logistic regression was carried out for
110 multivariate analysis. The level of significance was set at $p < 0.05$.

111 ETHICAL APPROVAL

112 Ethical approval was obtained from the Ethics Committee of the University of Port Harcourt
113 and University of Port Harcourt Teaching Hospital.

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116 3. RESULTS

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118 A total of 512 female students participated in the study. The age of the respondents ranged
119 from 15 to 31 years with a mean age of 22 ± 2.79 years. A total of 405 (79.1%) of the
120 respondents were less than 25 years of age, while 107 (20.9%) were 25 years and above.

121 Of the 512 respondents, 485 (94.7%) had heard about tetanus while 27 (5.3%) had not. Up
122 to 172 (33.6%) respondents heard about tetanus from a health worker, 150 (30.9%) from
123 school lessons, 67 (13.8%) heard about tetanus from the media, 40 (8.2%) from the media
124 and family members and 30 (6.2%) heard about tetanus from family members alone. A total
125 of 409 (79.9%) of the respondents had heard about tetanus toxoid while 103 (20.1%) had
126 not. Concerning the correct response as to the target population for tetanus toxoid
127 vaccination campaigns, 173 (33.8%) of the respondents correctly answered "women of
128 childbearing age". Sixty four (12.5%) answered "pregnant women only", 15 answered
129 "married women only" and 260 (50.8%) had no idea.

130 Table 1 shows the relationship between the knowledge of the target population for TT and
131 some variables. Correct knowledge of the target population for TT was significantly higher

among the older age group ($P = 0.013$) and those in Medical faculties ($P= 0.001$). A significantly increasing trend in the proportion of respondents with correct knowledge of the TT target population was also noticed with advancing year of study ($P= 0.001$).

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Table 1: Relationship between knowledge of tetanus toxoid target population and some variables

Correct Knowledge of Tetanus Toxoid target population						
Variable		Yes N (%)	No N (%)	Total N	Odds Ratio	P value
Age group	<25 years	126 (31.1)	279 (68.9)	405	0.576	0.013*
	≥25 years	47 (43.9)	60 (56.1)	107		
Year of study	One	39 (26.5)	108 (73.5)	147	1.000	<0.001*
	Two	45 (25.3)	133 (74.7)	178	1.067	
	Three	14 (29.8)	33 (70.2)	47	0.851	
	Four	31 (33.3)	62 (66.7)	93	0.722	
	Five	3 (100.0)	0 (0.0)	3	0.000	
	Six	41 (93.2)	3 (6.8)	44	0.026	

College / Faculty	Medical	46 (71.9)	18 (28.1)	64	6.459	<0.001*
	Non - medical	127 (28.4)	321 (71.6)	448		

138 * = significant

139 Only 93 (18.2%) of the respondents knew that the complete number of shots for TT was 5
140 shots. Other respondents gave various answers from 1 – 4 and 319 (62.3%) had no idea
141 Table 2 shows the relationship between the knowledge of the complete dose of TT and
142 some variables. Correct knowledge of the complete dose of TT was significantly higher
143 among the older age group ($P = 0.001$) and those in Medical faculties ($P=0.001$).

144 **Table 2: Relationship between knowledge of tetanus toxoid complete dose and some**
145 **variables**

Correct Knowledge of Tetanus Toxoid complete dose						
Variable		Yes N (%)	No N (%)	Total N	Odds ratio	P value
Age group	<25 years	53 (13.1)	352 (86.9)	405	0.252	<0.001*
	≥25 years	40 (37.4)	67 (62.6)	107		
Year of study	One	14 (9.5)	133 (90.5)	147	1.000	<0.001*
	Two	24 (13.5)	154 (86.5)	178	1.481	
	Three	5 (10.6)	42 (89.4)	47	1.313	

College / Faculty	Four	9 (9.7)	84 (90.3)	93	1.018	
	Five	1 (33.3)	2 (66.7)	3	4.750	
	Six	40 (90.0)	4 (9.1)	44	95.000	
	Medical	39 (60.9)	25 (39.1)	64	11.382	<0.001*
	Non – medical	54 (12.0)	394 (88.0)	448		

146 * = significant

147 When a logistic regression analysis was done of the same variables relating to correct
 148 knowledge of target population for TT and the complete dose of TT as shown in Table 3,
 149 there was no statistically significant difference noticed between variables.

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151 **Table 3: Logistic regression analysis of factors relating to Correct knowledge of**
 152 **Tetanus Toxoid target population and complete dose**

Term	Correct Knowledge of:					
	Target population for TT			Complete dose of TT		
	Odds Ratio	Confidence Interval	P-Value	Odds Ratio	Confidence Interval	P-Value
Age group (<25 / ≥25 years)	0.7281	1.2887	0.276	1.5829	3.1188	0.1844
Faculty (Non medical / Medical)	1.4676	4.9799	0.5383	1510913	>1.012	0.9669
Year of study (Reference: Five)						
One	0	>1.012	0.9596	0.1285	2.236	0.1592

Two	0	>1.012	0.9595	0.1805	3.0593	0.2358
Three	0	>1.012	0.9605	0.2316	4.4518	0.3321
Four	0	>1.012	0.9606	0.1165	2.0655	0.1428
Six	0	>1.012	0.9712	13863545	>1.012	0.9618

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154 Concerning the effectiveness of TT, 309 (60.4%) thought it was effective, 32 (6.2%) thought
 155 it was not and 171 (33.4%) had no idea.

156 A total of 298 (58.2%) of the respondents had received at least one dose of TT and 214
 157 (41.8%) had not received any at all. The most common occasion on which TT was received
 158 was after an injury (57.7%), routine (32.6%) and during antenatal care (10.1%).

159 Figure 1 shows the reasons for not receiving any dose of TT. Most of the respondents who
 160 did not receive any dose of TT had no reason for not doing so. The next popular reason
 161 seen among 59 of the respondents was not being aware.

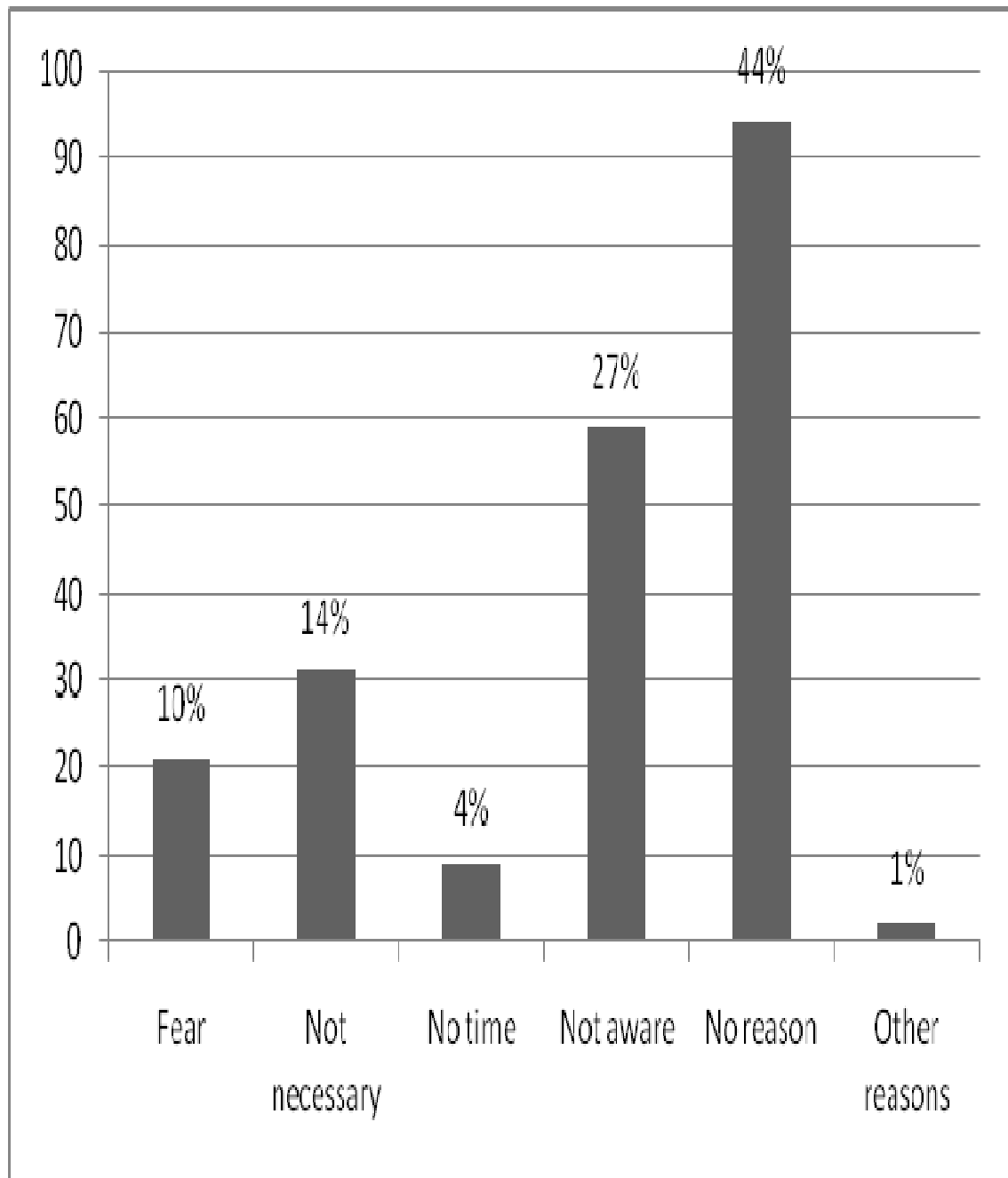


Figure 1: Reasons for not receiving tetanus toxoid vaccination.

Table 4 shows the relationship between having received at least a dose of TT vaccination and some variables. Being in a medical department ($p < 0.001$), being confident in the effectiveness of TT ($P= 0.001$), a higher year of study ($P= 0.001$), correct knowledge of TT target population ($P=0.001$) and correct knowledge of the complete dose of TT ($P=0.001$) were significantly associated with receiving at least a dose of TT.

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Table 4: Relationship between receiving tetanus toxoid vaccination and its determinants

		Received Tetanus Toxoid vaccination			Odds Ratio	P value
Variable		Yes N (%)	No N (%)	Total N		
Age group	<25 years	231 (57.0)	174 (43.0)	405	0.793	0.298
	≥25 years	67 (62.6)	40 (37.4)	107		
Year of study	One	72 (49.0)	75 (51.0)	147	1.000	<0.001*
	Two	100 (56.2)	78 (43.8)	178	0.749	
	Three	28 (59.6)	19 (40.4)	47	0.651	
	Four	55 (59.1)	38 (40.9)	93	0.662	
	Five	3 (100.0)	0 (0.0)	3	0.000	
	Six	40 (90.9)	4 (9.1)	44	0.096	
College / Faculty	Medical	52 (81.2)	12 (18.8)	64	3.558	<0.001*
	Non - medical	246 (54.9)	202 (45.1)	448		
Confidence in effectiveness of TT	Yes	215 (69.6)	94 (30.4)	309	0.302	< 0.001*
	No	83 (40.9)	120 (59.1)	203		

Knowledge of tetanus toxoid target population	Correct	133 (76.9)	40 (23.1)	173	3.506	<0.001*
	Wrong	165 (48.7)	174 (51.3)	339		
Knowledge of tetanus toxoid complete dose	Correct	72 (77.4)	21 (22.6)	93	3.506	<0.001*
	Wrong	226 (53.9)	193 (46.1)	419		

174 * = significant

175 Out of the 298 respondents that received at least a dose of TT, 10 (3.4%) had received 5
 176 complete doses (2.0% of the total number of respondents), 15 (5%) had received 4 doses,
 177 41 (13.8%) had received 3 doses, 85 (28.5%) had received 2 doses and 84 (28.2%) had
 178 received only TT1.

179 Table 5 shows the relationship between receiving the complete dose of TT and some
 180 variables. The older age group ($p = 0.022$), being confident in the effectiveness of TT ($P =$
 181 0.047), correct knowledge of TT target population ($P=0.001$) and correct knowledge of the
 182 complete dose of TT ($P=0.001$) were significantly associated with receiving the complete
 183 dose of TT.

184 **Table 5: Relationship between receiving complete dose of tetanus toxoid vaccination**
 185 **and its determinants**

Received complete dose of Tetanus Toxoid vaccination						
Variable		Yes N (%)	No N (%)	Total N	Odds Ratio	P value
Age group	<25 years	5 (1.2)	400 (98.8)	405	2.928	0.022*
	≥25 years	5 (4.7)	102 (95.3)	107		
Year of study	One	3 (2.0)	144 (98.0)	147	1.000	0.371
	Two	3 (1.7)	175 (98.3)	178	0.823	

	Three	1 (2.1)	46 (97.9)	47	1.043	
	Four	0 (0.0)	93 (100.0)	93	0.000	
	Five	0 (0.0)	3 (100.0)	3	0.000	
	Six	3 (6.8)	41 (93.2)	44	3.512	
College / Faculty	Medical	3 (4.7)	61 (95.3)	64	3.098	0.118
	Non - medical	7 (1.6)	441 (98.4)	448		
Confidence in effectiveness of TT	Yes	9 (2.9)	300 (97.1)	309	0.165	0.047*
	No	1 (0.5)	202 (99.5)	203		
Knowledge of tetanus toxoid target population	Correct	9 (5.2)	164 (94.8)	173	18.548	<0.001*
	Wrong	1 (0.3)	338 (99.7)	339		
Knowledge of tetanus toxoid complete dose	Correct	7 (7.5)	86 (92.5)	93	11.287	<0.001*
	Wrong	3 (0.7)	416 (99.3)	419		

186 * = significant

187 Table 6 shows the logistic regression analysis of some variables relating to receiving tetanus
188 toxoid vaccination by the respondents. After adjusting for various factors, only confidence in
189 effectiveness of tetanus toxoid vaccine (OR = 2.4074, P = 0.000, Confidence Interval
190 =3.5982) and the correct knowledge of the target population for tetanus toxoid (OR = 2.1362,
191 P = 0.003, Confidence Interval = 3.5426) significantly influenced receiving at least a dose of
192 tetanus toxoid among the respondents. No factor was found to be significantly associated
193 with the completion of the 5 doses of TT vaccine.

194 **Table 6: Logistic regression analysis of factors relating to receiving Tetanus Toxoid**
195 **vaccination**

Variable	Received at least a dose of TT vaccination			Received complete dose of TT vaccination		
	Odds Ratio	Confidence Interval	P-Value	Odds Ratio	Confidence Interval	P-Value
Age group (<25 / ≥25 years)	0.8543	1.4297	0.549	2.4585	10.5855	0.2272
Faculty (Non medical / Medical)	0.9538	2.9627	0.9348	1.7767	8.843	0.4827
Confidence in effectiveness of tetanus toxoid (Yes / No)	2.4074	3.5982	0.000*	1.6147	15.238	0.6757
Knowledge of tetanus toxoid target population (Correct / Wrong)	2.1362	3.5426	0.0033*	8.4928	90.535	0.0764
Knowledge of tetanus toxoid complete dose	1.2547	2.523	0.5243	0.3082	1.6145	0.1636

* = significant

4. DISCUSSION

Nigeria is one of the five countries said to be responsible for half of the global neonatal deaths [17] and the country is also among the 24 countries in which maternal and neonatal tetanus is still a public health threat [4], contributing significantly to the neonatal deaths in the

country [9]. Our results indicate that majority of our respondents were aware of the existence of tetanus and tetanus toxoid vaccine, corroborating the finding in a previous study [18]. This high level of awareness may be attributable to the high educational qualification of the respondents. The fact that the Commonest source of information was health workers, followed by classroom lessons, demonstrates the important role health facilities and schools can play in dissemination of health information to the general public.

Interestingly, despite the three phases of the maternal and neonatal tetanus elimination campaigns which were carried out in Rivers State in the recent past [14], our respondents still exhibited a very poor knowledge of the programme. Only one third of the respondents knew that the tetanus toxoid vaccination campaign is targeted at women of childbearing age. More than half of the respondents did not know the target population, while 15.4% of the respondents were under the misconception that it is targeted at married women only or pregnant women only. Similarly, a very small proportion (18.2%) of the respondents knew that the complete dose for tetanus toxoid is 5 doses. This poor knowledge of the tetanus toxoid vaccination programme and the high level of misconception about the target population may have contributed to the poor up-take of the vaccine by women of childbearing age in Nigeria, as has been previously reported [12].

In this study, correct knowledge of the target population and the correct number of doses of tetanus toxoid to be administered are positively associated with being older in age, higher academic level and being in the Faculty of Medicine. This is not surprising because it shows the positive relationship between higher educational attainment and general knowledge about disease prevention. Students in Faculty of Medicine may have received detailed information about the tetanus toxoid vaccination programme in course of their academic pursuits and were therefore operating at a higher knowledge level compared to the students from other faculties. Basher [19] also reported similar findings among medical students India. The study further showed that majority (60.4%) of the students thought that TT is effective in preventing tetanus. This confirms the report of Naeem et al who made similar observations

229 [20], though in the previous study, a higher proportion (89.5%) of respondents thought TT
230 was effective.

231 The United Nations International Children's Fund (UNICEF), World Health Organization
232 (WHO) and United Nations Population Fund (UNFPA) recommended that in high risk
233 countries such as Nigeria, 90% of women of childbearing age should receive TT to achieve
234 and maintain elimination of maternal and neonatal tetanus [1,10]. In this study, only 58.2% of
235 the respondents had received at least one dose of TT, showing that Nigeria still has a long
236 way to go in this fight to eliminate maternal and neonatal tetanus. It also supports the
237 statement of UNICEF that only 60% of babies born in Nigeria are protected at birth (PAB)
238 against tetanus [21]. This result however compares favourably with the 3.1%, 39.8% and
239 55.6% reported by Orimadegun [13] in South Western Nigeria, Qadir et al. [17] and Naeem
240 et al[19] in Pakistan. It is however lower than the 70.9% reported among medical students in
241 Mymensingh, India by Basher [19] and 68% reported by Singh et al. [22] in rural North India.
242 These differences in observation maybe due to differences in level of awareness, knowledge
243 of tetanus toxoid **vaccination** programme for women of childbearing age and the sample
244 size.

245 The study further indicate that the most common occasion for receiving TT among the
246 respondents was following an injury. Routine **vaccination** was the second most common
247 reason for receiving TT. Orimadegun et al [13] also had similar observation in Western
248 Nigeria. The results in this study also showed that majority of the respondents who did not
249 receive TT had no reason for not doing so; the next commonest reason was lack of
250 awareness. This shows that with adequate community awareness campaign aimed at
251 increasing the knowledge of women of childbearing age about the danger of maternal and
252 neonatal tetanus and the need to prevent the disease by receiving 5 doses of TT
253 **vaccination**, the rate of **vaccination** may improve and Nigeria may meet the 90% target
254 needed for the elimination of maternal and neonatal tetanus [1].

255 The study further revealed the very poor status of TT5 vaccination coverage among the
256 respondents. Only 3.4% of the respondents who received at least one dose of TT received
257 the complete 5 doses, i.e.2% of all the respondents. This finding explains why Nigeria is still
258 burdened with the problem of maternal and neonatal tetanus. The poor knowledge of the
259 respondents on TT vaccination programme for women of childbearing age may have
260 affected their uptake of the vaccine. Studies from other developing countries also reported a
261 very poor TT5 vaccination coverage among women of childbearing age [18, 19].

262 Bivariate analysis showed that being in the medical faculty, being older in age, higher year of
263 study, being confident in the effectiveness of TT, having correct knowledge of the target
264 population and the complete dose of TT vaccine were positively associated with receiving TT
265 vaccination. However, after multivariate logistic regression analysis, only being confident in
266 the effectiveness of TT vaccine in preventing tetanus and the knowledge of the target
267 population of TT vaccination campaign significantly influenced receiving at least one dose of
268 the vaccine. This highlights the important role health education in schools, health facilities
269 and the mass media can play in boosting TT vaccination coverage by women of childbearing
270 age.

271 The first limitation of the study is that the information sought is based on self-report and is
272 subject to over or under reporting. Secondly vaccination received during childhood and the
273 adolescent period may not be easily remembered in adulthood. Thirdly, medical students
274 were included in the study. These students operated at a higher knowledge level due to their
275 training compared to students from other faculties.

276

277 **5. Conclusion**

278 There was a high level of awareness about tetanus and tetanus toxoid vaccine but poor
279 knowledge of the tetanus toxoid vaccination programme for women of child bearing age
280 among female undergraduate students in Port Harcourt. There was also very poor coverage
281 of TT5 among the students. Students who had knowledge of the target population of the TT

282 vaccination campaign and those who had confidence in the effectiveness of TT vaccine in
283 preventing tetanus were twice more likely to receive at least one dose of TT vaccine
284 compared to their counterparts who lacked such knowledge and also lacked confidence in
285 the effectiveness of the vaccine. .

286 Future campaigns should also target female undergraduate students in university campuses.
287 The students should be educated on the danger of maternal and neonatal tetanus, the
288 availability of a safe and effective vaccine and the vaccination schedule for women of
289 childbearing age.

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