

# Factors that Affect Compliance with Annual Ivermectin Treatment and Willingness of Individuals to Continue with treatment in Abia State, Nigeria.

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## ABSTRACT

This study was designed to document individuals' adherence to annual ivermectin treatment and people's willingness to continue taking ivermectin, as an important predictor of sustained compliance with long-term ivermectin treatment. The study which was conducted between April and September, 2011 adopted a cross-sectional approach in collecting quantitative and qualitative data from the two Local Government Areas of Abia State that were assessed by REMO as hyper-endemic for onchocerciasis. The study population involved both high and low compliers groups. A Structured questionnaire was administered to 558 people to determine the factors that positively influence compliance to annual ivermectin treatment. Of these, 195 (34.9%) were males while 363 (65.1%) were females. Among these groups, 53.8% and 57.3% of males and females respectively were treated before. Of the 195 males and 363 females, only 25 (12.8%) males and 45 (12.4%) females were high compliers. Factors identified that influenced compliance were "have heard/seen benefits of treatment", 459 (82.3%) and "to avoid blindness", 312 (55.9%). However, "lack of information", 62 (11.1%) and "side reactions to drug", 38 (6.8%) were detrimental to compliance. On their willingness to continue with the drug, 483 (86.6%) claimed that most people take the drug, 495 (88.7%) affirmed that most people will continue with the drug while 555 (99.5%) indicated that they are personally willing to continue with the drug if made available. This is confirmed by the Chi-square ( $\chi^2$ ) analysis at 0.05 level of significance that people are personally willing to continue with the drug if available ( $\chi^2_{cal} = 163.585$ ,  $P$ -value < 0.0001). Suggestions on ways to improve compliance to annual and long-term ivermectin treatment showed that health education/enlightenment ranked very high (78.3%). This is followed by "awareness through church/school" (77.5%). It is imperative that the existing

health education materials be reviewed by taking into cognizance such factors that will improve annual and long-term compliance. Such materials should emphasize compliance among youths and children 5 years and above.

16  
17 *Keywords: Improve compliance, annual ivermectin treatment, willingness to treatment,*  
18 *factors affecting compliance.*

## 19 20 **1. INTRODUCTION**

21  
22 The establishment of African Programme for Onchocerciasis Control (APOC) in 1995 with  
23 the mandate to establish within a period of 12 to 15 years, effective and self-sustainable  
24 community- directed treatment with ivermectin throughout the endemic areas within the  
25 geographical scope of the programme (1), requires a clear understanding of the long-term  
26 compliance process in order to guide countries towards sustainability. According to  
27 projections by epidemiologists, it is believed that onchocerciasis could be controlled in  
28 endemic communities if 100% of eligible populations take their treatment regularly over a  
29 period of 10 to 15 years or more (2, 3). With one annual dose of ivermectin, it is estimated  
30 that 70% of the target population would have to be treated, for the long-term project of  
31 elimination of the disease to be a reality (4).

32 The current mainstay of onchocerciasis control is chemotherapy, using ivermectin alone or,  
33 in small and isolated foci, combined with vector elimination. Most tablets of ivermectin are  
34 now distributed in an approach known as community – directed treatment with ivermectin  
35 (CDTI), which was adopted by the African Programme for Onchocerciasis Control (APOC) in  
36 1995. Its goal was to put in place a sustainable drug distribution system and maintain a  
37 minimum of 65% annual population coverage with Mectizan (brand name for ivermectin) in  
38 endemic communities for at least 15 years, required for effective control of onchocerciasis  
39 (5, 6, 7, 8). Currently, over 68 million people are being treated with a single annual dose of  
40 ivermectin every year in Africa (9). In CDTI, community ownership of the ivermectin –  
41 treatment programme is emphasized, with endemic communities themselves involved in the  
42 planning, implementation, coordination and monitoring of all treatment activities (10). As an  
43 annual dose of ivermectin does not permanently interrupt transmission of the parasite that  
44 **causes** onchocerciasis, distribution of the drug will probably have to be repeated for many  
45 years, even if high treatment coverage are achieved and sustained (11). Compliance with  
46 annual ivermectin treatment has become a major challenge for APOC as the original 25  
47 projects which started in 1997/1998 have been operating for over a decade. Annual  
48 compliance studies have become possible and extremely desirable, since researchers are  
49 now lengthening the timeframe for annual ivermectin dosing from 15 to 25 or more years  
50 (12), and the coverage rate from 65% to 80% (13). To date, published reports of CDTI  
51 intervention have focused on coverage. While reports of population coverage are

52 encouraging (14), only few studies have centered on compliance to annual ivermectin  
53 treatment. Coverage rates in a community may not give the full picture of the success of the  
54 programme because there may be individuals or groups who systematically do not comply  
55 over the years and thus provide a continued focus for the disease transmission. Such low  
56 compliance group needs to be properly informed on the need to comply with annual  
57 ivermectin treatment necessary for total elimination of the disease. This study highlights the  
58 factors that necessitate high compliance and suggests ways to improve annual and long-  
59 term ivermectin treatment

60

## 61 **2. METHODOLOGY**

62

63 **Study Area:** Abia State is located in the south eastern part of Nigeria. The State lies  
64 between latitude  $4^{\circ} 45^1$  and  $6^{\circ} 15^1$  North and longitude  $6^{\circ} 30^1$  and  $8^{\circ} 9^1$  East. It is bordered on  
65 the north and northeast by Ebonyi and Enugu States respectively and on the east by Cross  
66 River and Akwa Ibom States. Its southern border is shared with River State while its western  
67 border is shared with Imo and Anambra states. The people of Abia State are part of Ibo  
68 ethnic group and are known like their kinsmen to be highly mobile. They are very dynamic  
69 and are predominantly farmers, artisans and civil servants. The people are united and speak  
70 "Igbo" language as a common language, though several dialects exist. Other ethnic groups  
71 also reside with the dominant Igbo speaking people.

72

73 Abia State falls within the rain forest zone. The topography is undulating with hills and  
74 valleys hence susceptible to gully erosion. The area is large and terrain very difficult. The  
75 area has fast-flowing Imo River with its tributaries and many streams such as Iyi-ukwu and  
76 Ihuku that serve as breeding sites for the black fly.

77

78 The State is made up of 17 Local Government Areas (LGAs) with a population of 2,883,399  
79 according to 2006 census. Eight of the seventeen LGAs in the State are endemic for  
80 onchocerciasis (2 hyper-endemic and 6 meso-endemic LGAs) (Ukairo N. Annual Project  
81 Technical Report on Abia CDTI Submitted to Technical Consultative Committee of African  
82 Programme for Onchocerciasis Control, 2008). The study area captured the two LGAs which  
83 were assessed by REMO (Rapid Epidemiological Mapping of Onchocerciasis) as being  
84 hyper-endemic for onchocerciasis (Braide EI, Franzen C, Saka YA, Isiyaku S. and  
85 Onwujekwa O. Assessment of the sustainability of the Abia State CDTI Project. Nigeria  
86 WHO/APOC Report, 2003).

87

88 Onchocerciasis control efforts began in the state in 1991 in Mbala-Isuochi as pilot area, with  
89 the assistance and support of the River Blindness Foundation in collaboration with the State

90 Ministry of Health. By 1994/1995, the programme had spread to other LGAs of the State.  
91 Currently, the project has lasted for over seventeen years.

92

93 **Study Design:** The study was designed to assess the rate of compliance to annual  
94 ivermectin treatment which has lasted for over 17 years, and the factors that can influence  
95 individual's willingness to continue the treatment for the foreseeable future. The study  
96 participants were individuals between ages 6 and above who were resident in the area. The  
97 participants were grouped into two: the low compliance group comprising of those who had  
98 taken ivermectin for less than 8 years and high compliance group comprising of those who  
99 had taken ivermectin for 8 years and above. The cross-sectional approach was adopted  
100 through collecting quantitative and qualitative data from the two Local Government Areas in  
101 Abia State that were assessed by REMO as hyper-endemic for onchocerciasis. A specially  
102 designed individual form was used to gather information for respondent's personal data. The  
103 personal data information included the following: household name/code, age, sex, marital  
104 status, educational status, occupation, village/village code, community, LGA and the number  
105 of years resident in the village.

106 .

107 **Ethical Clearance:** Ethical review and clearance of the research protocol, research  
108 instruments and informed consent procedures were obtained from the Ethical Review  
109 Committee of the Department of Animal and Environmental Biology, Imo State University,  
110 Owerri. The approval for the survey was obtained from Abia State Ministry of Health.

111 **Preliminary Survey and Advocacy:** The pre-disease survey logistics included visits to the  
112 Local Government Chairmen of the two LGAs, the traditional rulers of the autonomous  
113 communities and the village heads to explain the purpose of the study and to solicit their co-  
114 operation. The pre-disease survey logistics also involved mobilization of the community-  
115 directed distributors (CDDs) and other village-based field assistants who were involved in  
116 the distribution of the drug. The communities selected on the basis of their hyper-endemic  
117 status are currently being treated with ivermectin.

118 **Epidemiological and Social Science Method of Data Collection:** Epidemiological and  
119 social science methods of data collection were used to collect data on the study objectives  
120 and research questions. The study lasted from April to September, 2011. Individuals (seven  
121 men and seven women) who volunteered and have been living in the community for over 8  
122 years formed the Focus Group Discussion (FGD) participants. The rate of compliance was  
123 determined on the number of times the drug (ivermectin) was swallowed. Individuals who  
124 had taken the drug less than eight times were regarded as low compliers while high  
125 compliers were those who had taken the drug for eight or more times

126 **Data collection:** Four instruments were employed in this study, each targeting different  
127 sources of information to investigate the research questions. Since most of the participants  
128 were illiterate, the recruited field assistants assisted the participants in completing the  
129 questionnaires. The sample size was estimated using Krejcie and Morgan (15) formula for  
130 determining sample size for research activities:

131  $S = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P (1-P)}$  where N (population size) = 116,749.

132 Five hundred and fifty eight individual questionnaires were properly filled out and returned  
133 for assessment. The instruments employed were:

- 134 • Annual Treatment Form to obtain information on individual compliance.
- 135 • In-depth Interview Guide with community leaders and community-directed  
136 distributors (CDDs) to obtain information on duration of treatment, factors  
137 that affect compliance, their willingness to continue the treatment and ways  
138 to improve annual and long-term ivermectin treatment
- 139 • Individual Questionnaire to collect information on willingness to continue  
140 treatment and ways to improve compliance of community members to  
141 annual and long-term ivermectin treatment.
- 142 • Focus Group Discussion Guide to probe the more sensitive issues on  
143 disease treatment.

144 **Statistical Analysis:** The data on factors affecting compliance to annual ivermectin  
145 treatment was described using percentages. Chi-square ( $\chi^2$ ) analytical technique was  
146 employed to ascertain the effect of demography on compliance and the level of willingness  
147 of community members to continue ivermectin treatment. Bar Chart was used to allow for  
148 quick appreciation of the suggestions to improve annual and long-term ivermectin  
149 compliance.

150

### 151 3. RESULTS

152 The effect of demographic factors on compliance rate from household survey is shown in  
153 Table 1. Out of 558 individuals interviewed, 195 (34.9) were males and 363 (65.1%) were  
154 females. Among these groups, 53.8% and 57.3% of males and females respectively were  
155 treated before. Out of the 195 males and 363 females, only 25 (12.8%) males and 45  
156 (12.4%) females were high compliers. The Chi-square ( $\chi^2$ ) analysis at 0.05 level of  
157 significance revealed that sex does not affect the rate of compliance to drug (i.e.  $\chi^2_{cal.}$   
158 =0.615; *P-value* =0.433).

159

Factors		Sample number N=558	No. treated before and percentage (%)	No. of high compliers	% compliance	Yates $\chi^2$ value, <i>P-value</i>
Sex	Male	195	105 (53.8)	25	12.8	$\chi^2_{cal} = 0.615$ <i>P-value</i> = 0.433
	Female	363	208 (57.3)	45	12.4	
Age	6-11yrs	89	18 (20.2)	0	0.0	$\chi^2_{cal} = 140.486$ , <i>P-value</i> < 0.0001
	12-24yrs	67	08 (11.9)	1	1.5	
	25 and above	402	289 (71.9)	69	17.2	
Education	None	174	125 (71.8)	23	13.2	$\chi^2_{cal} = 26.723$ <i>P-value</i> < 0.0001
	Primary	242	119 (49.6)	25	10.3	
	Secondary	142	67 (47.2)	14	9.9	

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162

163 Stratifying by age, the results revealed that out of 558 individuals interviewed, 89 (15.9%)  
 164 were between ages 6 -11 years, 67 (12.0%) were between ages 12 – 24 years, while 402  
 165 (72.0%) were 25 years and above. Among the ages 25 and above, 289 (71.9%) had been  
 166 treated before with 69 (17.2%) as high compliers. Among ages 12-24, only 8 (11.9%) had  
 167 been treated before with only 1 (1.5%) high complier. Among the 89 between ages 6-11  
 168 interviewed, only 18 (20.2%) had been treated before. The statistical analysis revealed that  
 169 age has a great effect on the intake of drug and compliance (i.e.  $\chi^2_{cal.} = 140.486$ ; *P-value* <  
 170 0.0001). On education and levels of education, result obtained shows that education and  
 171 levels of education contributed significantly to the consumption of the drug within the  
 172 demographic location under statistical investigation (i.e.  $\chi^2_{cal}=26.723$ ; *P-value* <0.0001).

173

174 Of the five hundred and fifty eight individuals interviewed on the factors that positively  
 175 influence individual compliance to annual ivermectin treatment (Table 2), 459 (82.3%)  
 176 claimed they “have heard/ seen benefits”, 312 (55.9%) said the influencing factor was “to  
 177 avoid blindness”, while 170 (30.5%) said “awareness has been created”. Other positively  
 178 influencing factors include: “to be healthy”, 137 (24.6%); “it gives energy”, 109 (19.5%) and  
 179 “to avoid itching”, 94 (16.9%) However, the factors that were detrimental to compliance were  
 180 “lack of information”, 62 (11.1%); “side reactions”, 38 (6.8%); “non-availability of drug”, 24  
 181 (4.3%) and “late arrival of drug”, 19 (3.4%).

182

183 **Table 2: Factors influencing compliance**

Factors influencing compliance	Percentage (N=558)	Factors detrimental to compliance	Percentage (N=558)
Have heard/seen benefits	82.3	Lack of information	11.1
To avoid blindness	55.9	Side reactions	6.8
Awareness has been created	30.5	Non -availability of drug	4.3
To be healthy	24.6	Late arrival of drug	3.4
It gives energy	19.5		
To avoid itching	16.9		

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185

186 On the willingness to continue with ivermectin treatment by most individuals (Table 3), 483  
 187 (86.6%) out of 558 indicated that most people take the drug; 495 (88.7%) affirmed that most  
 188 people will continue with the drug while 555 (99.5%) said that they are personally willing to  
 189 continue with the drug if made available. The *P-value* of 0.0000 against 0.05 level of  
 190 significance indicates that the factors of study, “willingness to take ivermectin and response”,  
 191 are not independent.

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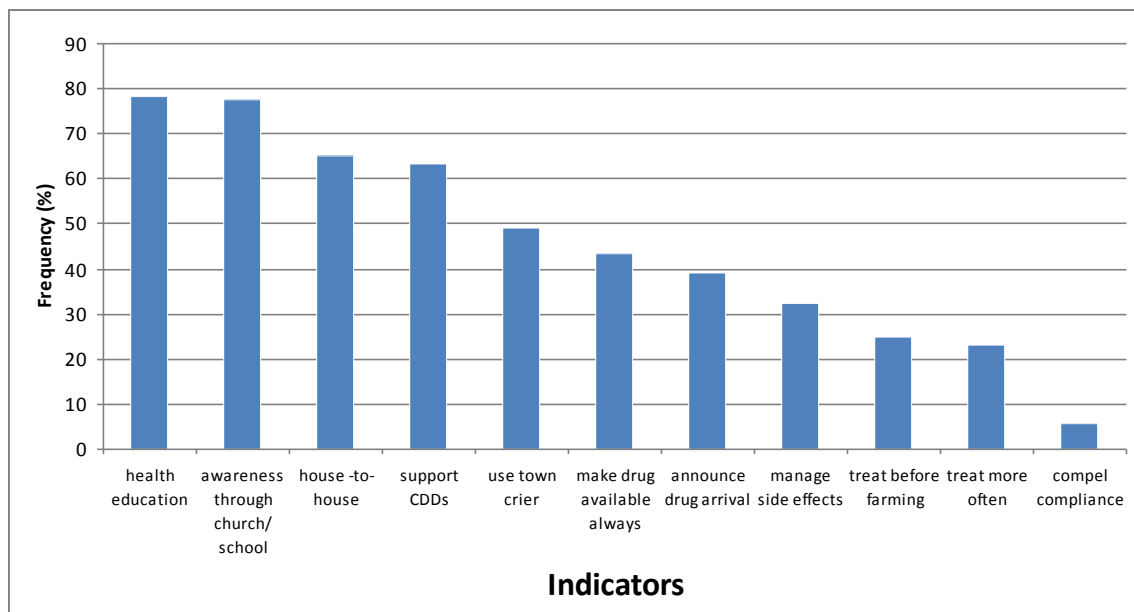
193 **Table 3: Willingness to continue ivermectin treatment among individuals**

Willingness to take drug	Response		
	Yes (%)	No (%)	Don't know (%)
Most people take	483 (86.3)	49 (8.8)	26 (4.7)
Most people will continue	495 (88.7)	0	63 (11.3)
Personally willing to continue	555 (99.5)	0	3 (0.5)

194

195

196 Suggestions on the ways to improve compliance to annual ivermectin treatment in order of  
 197 priority are shown in Figure 1. They are “health education/ enlightenment” (78.3%),  
 198 “awareness through church/school” (77.5%), “house-to-house distribution” (65%) and  
 199 support CDDs (63.3%).



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201

202 Fig. 1: Suggested ways to improve compliance to annual and long term ivermectin treatment

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206 **4. DISCUSSION**

207

208 Results from the demographic survey on households revealed that gender did not affect  
 209 compliance; however age and the levels of education had great effect on compliance.  
 210 Findings from the survey revealed that the elderly who were mostly illiterate were available  
 211 for treatment while the literate adults and youths were away in cities working or schooling.  
 212 This is supported by a Focal Group Discussion (FGD) participant who said that the elderly  
 213 are more in the village while the youths travel outside for work.

214

215 The results also revealed that ‘have heard/seen benefits’ and ‘to avoid blindness’ were  
 216 major factors that have accounted for the strong willingness of community members to  
 217 continue annual treatment of ivermectin. However, lack of information resulting from poor  
 218 mobilization and ignorance is a major factor contributing to low treatment compliance. Lack  
 219 of information on the availability of ivermectin to the community members was also cited as a  
 220 major reason for low compliance by (16, 17). Acceptance of ivermectin by individuals  
 221 depends on the awareness of the individual on the availability of the drug, its effectiveness  
 222 and benefits accruable to the individual. Therefore, there is the need for people to be aware,  
 223 get involved and participate in the control programmes. The compliance rate is high in  
 224 communities where members have reasonable knowledge about *Onchocerciasis* control



225 (The Carter Center River Blindness Program: annual reports/sentinel village evaluation  
226 reports, 2002)

227

228 The study also revealed that most people have knowledge of the drug, hence most of the  
229 respondents indicated that “most people take the drug” and are willing to continue. More  
230 people are willing to take ivermectin than before because the community distributors are part  
231 of the community and understand their people better. It is important that government  
232 ensures that the drug is available and procured early for distribution. Almost every person  
233 interviewed (99.5% of the respondents) said that they are personally willing to continue with  
234 the drug as long as the drug is available. It is important that these individuals who are  
235 personally willing to take the drug maintain the annual treatment if they desire complete  
236 eradication of the disease.

237

238 Suggestions were made on how to improve annual and long-term compliance by  
239 respondents. From the findings, “health education/enlightenment” ranked very high (78.3%).  
240 This is followed by “awareness through church/school” (77.5%), “house-to-house  
241 distribution” (65%) and “support CDDs” (63.3%). Health education was recommended as  
242 one of the main strategies towards improving treatment (18). It becomes imperative that the  
243 existing health education materials should be reviewed by taking into cognizance those  
244 factors associated with low compliance as well as perceptual factors like benefits of  
245 treatments and seriousness of the problem of *Onchocerciasis*. Health education materials  
246 should emphasize compliance, particularly among youths and children (5 years and above).  
247 Biannual treatment is recommended as a catch up round only for those who missed the  
248 previous round. It is believed that the implementation of these suggestions will not only  
249 improve annual compliance to ivermectin treatment but also boost the long-term compliance  
250 that will eventually eradicate onchocerciasis in Abia State.

251

## 252 **5. CONCLUSION**

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254 The findings showed there was a low frequency of high compliance. A compliance rate of  
255 12.8% and 12.4% were obtained for males and females respectively. Gender did not affect  
256 compliance to annual ivermectin treatment while age and levels of education had significant  
257 effects on compliance. Such factor like “have heard/ seen” benefits of treatment and “to  
258 avoid blindness” positively influenced compliance, while “lack of information” on the arrival of  
259 the drug and “side reactions” were detrimental to compliance. The study also showed that  
260 individuals are personally willing to continue with the drug if available. On suggestions for  
261 improvement on compliance, “health education/enlightenment” and “awareness through  
262 school/church” ranked very high. However, health education materials should be reviewed to  
263 emphasize compliance among youths and children (5 years and above).

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## AUTHORS' CONTRIBUTIONS

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Dr. O.R. Ezeigbo designed the study and wrote the first manuscript, Profs. B.E.B. Nwoke and C.N. Ukaga wrote the protocol and managed the analyses, while Ms R. O. Emecheta managed the literature searches. All authors read and approved the final manuscript.

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## ETHICAL APPROVAL (WHERE EVER APPLICABLE)

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All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.”

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