

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 (χ^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 cause 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

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61 2. METHODOLOGY

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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.

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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.

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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).

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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.

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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.

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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 determined using sample size determination table by**
130 **Krejcie and Morgan (15).** Five hundred and fifty eight individual questionnaires were
131 properly filled **out** and returned for assessment. The instruments employed were:

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

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

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149 **3. RESULTS**

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

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163 Table 1: Effects of demographic factors on compliance

Factors		Sample number N=558	No. treated before and percentage (%)	No. of high compliers	% compliance	Yates χ^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	$\chi^2_{cal} = 140.486$, <i>P-value</i> < 0.0001
	12-24yrs	67	08 (11.9)	01	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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166 Stratifying by age, the results revealed that out of 558 individuals interviewed, 89 (15.9%)
 167 were between ages 6 -11 years, 67 (12.0%) were between ages 12 – 24 years, while 402
 168 (72.0%) were 25 years and above. Among the ages 25 and above, 289 (71.9%) had been
 169 treated before with 69 (17.2%) as high compliers. Among ages 12-24, only 8 (11.9%) had
 170 been treated before with only 1 (1.5%) high complier. Among the 89 between ages 6-11
 171 interviewed, only 18 (20.2%) had been treated before. The statistical analysis revealed that
 172 age has a great effect on the intake of drug and compliance (i.e. $\chi^2_{cal.} = 140.486$; *P-value* <
 173 0.0001). On education and levels of education, result obtained shows that education and
 174 levels of education contributed significantly to the consumption of the drug within the
 175 demographic location under statistical investigation (i.e. $\chi^2_{cal.}=26.723$; *P-value* <0.0001).

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177 Of the five hundred and fifty eight individuals interviewed on the factors that positively
 178 influence individual compliance to annual ivermectin treatment (Table 2), 459 (82.3%)
 179 claimed they “have heard/ seen benefits”, 312 (55.9%) said the influencing factor was “to
 180 avoid blindness”, while 170 (30.5%) said “awareness has been created”. Other positively
 181 influencing factors include: “to be healthy”, 137 (24.6%); “it gives energy”, 109 (19.5%) and
 182 “to avoid itching”, 94 (16.9%) However, the factors that were detrimental to compliance were

183 “lack of information”, 62 (11.1%); “side reactions”, 38 (6.8%); “non-availability of drug”, 24
 184 (4.3%) and “late arrival of drug”, 19 (3.4%).

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

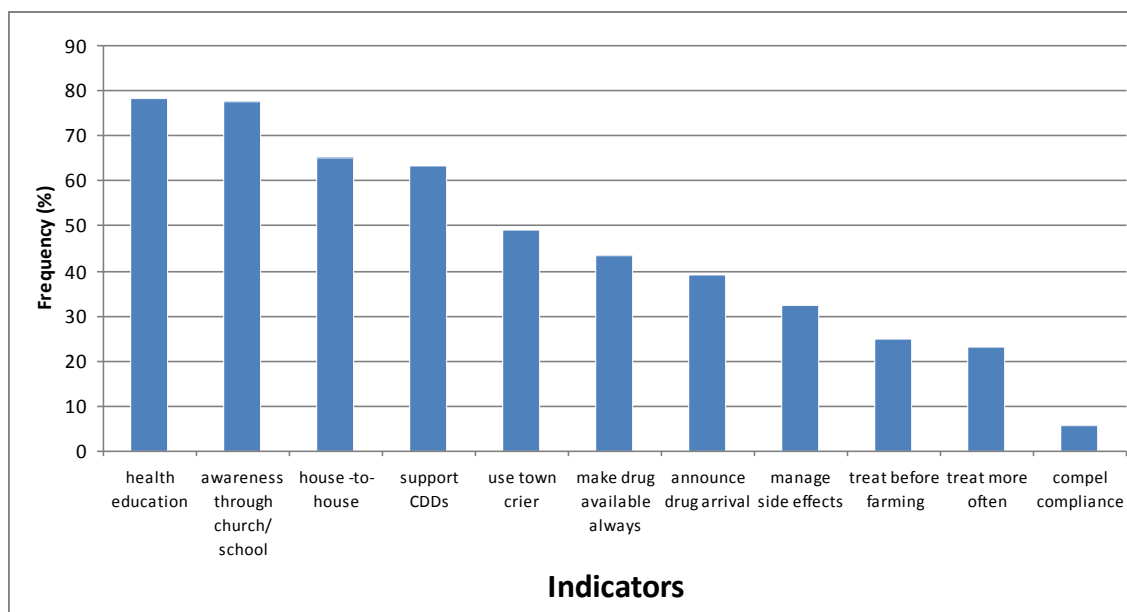
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Table 3: Willingness to continue ivermectin treatment among individuals

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)

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



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

4. DISCUSSION

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

218

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

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

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

241

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

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256 **5. CONCLUSION**

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258 The findings showed there was a low frequency of high compliance. A compliance rate of
259 12.8% and 12.4% were obtained for males and females respectively. Gender did not affect
260 compliance to annual ivermectin treatment while age and levels of education had significant
261 effects on compliance. Such factor like “have heard/ seen” benefits of treatment and “to
262 avoid blindness” positively influenced compliance, while “lack of information” on the arrival of
263 the drug and “side reactions” were detrimental to compliance. The study also showed that
264 individuals are personally willing to continue with the drug if available. On suggestions for
265 improvement on compliance, “health education/enlightenment” and “awareness through
266 school/church” ranked very high. However, health education materials should be reviewed to
267 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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