

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

Ezeigbo OR^{1*}, Nwoke² BEB, Ukaga² CN, Emecheta¹ RO

¹Department of Biology/Microbiology, Abia State Polytechnic, Aba

² Department of Animal and Environmental Biology, Imo State University, Owerri

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 ($\chi^2_{cal} = 163.585$, $P\text{-value} < 0.0001$). 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 on 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), a clear understanding of the long-term
26 compliance process is required in order to guide countries towards sustainability. According
27 to 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 annual dose of ivermectin, it is estimated that
30 70% of target population would have to be treated, for the long-term project of elimination of
31 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, CDTI is on-going in over 95,000 communities where over 98 million
40 ivermectin tablets are distributed annually to treat over 33 million people (9). In CDTI,
41 community ownership of the ivermectin – treatment programme is emphasized, with
42 endemic communities themselves involved in the planning, implementation, coordination and
43 monitoring of all treatment activities (10). As an annual dose of ivermectin does not interrupt
44 transmission of the parasite that cause onchocerciasis, distribution of the drug will probably
45 have to be repeated for many years, even if high treatment coverage are achieved and
46 sustained (11). Compliance with annual ivermectin treatment has become a major challenge
47 for APOC as the original 25 projects which started in 1997/1998 have been operating for
48 over a decade. Annual compliance studies have become possible and extremely desirable,
49 since researchers are now pushing back the timeframe for annual ivermectin dosing from 15
50 to 25 or more years (12), and the coverage rate from 65% to 80% (13). To date, published
51 reports of CDTI intervention have focused on coverage. While reports of population

52 coverage are encouraging (9), only few studies have centered on compliance to annual
53 ivermectin treatment. Coverage rates in a community may not give the full picture of the
54 success of the programme because there may be individuals or groups who systematically
55 do not comply over the years and thus provide a continued focus for the disease
56 transmission. Such low compliance group needs to be properly informed on the need to
57 comply with annual ivermectin treatment necessary for total elimination of the disease. This
58 study highlights the factors that necessitate high compliance and suggests ways to improve
59 annual and long-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. The State is
65 made up of 17 Local Government Areas (LGAs), eight of which are endemic for
66 onchocerciasis (Ukairo N. Annual Project Technical Report on Abia CDTI Submitted to
67 Technical Consultative Committee of African Programme for Onchocerciasis Control, 2008).

68 The study area captured the two LGAs which were assessed by REMO (Rapid
69 Epidemiological Mapping of Onchocerciasis) as being hyper-endemic for onchocerciasis
70 (Braide EI, Franzen C, Saka YA, Isiyaku S. and Onwujekwa O. Assessment of the
71 sustainability of the Abia State CDTI Project. Nigeria WHO/APOC Report, 2003).

72 Onchocerciasis control efforts began in the state in 1991 in Mbala-Isouchi as pilot area, with
73 the assistance and support of River Blindness Foundation in collaboration with the State
74 ministry of Health. By 1994/1995, the programme had spread to other LGAs of the State.
75 Currently, the project has lasted for over seventeen years.

76

77 **Study Design:** The study was designed to assess the rate of compliance to annual
78 ivermectin treatment and the factors that can influence individual's willingness to continue
79 the treatment for the foreseeable future. **The cross-sectional approach was adopted in
80 collecting quantitative and qualitative data from the two Local Government Areas in Abia
81 State that were assessed by REMO as hyper-endemic for onchocerciasis.**

82

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

87 **Preliminary Survey and Advocacy:** The pre-disease survey logistics included visits to the
88 Local Government Chairmen of the two LGAs, the traditional rulers of the autonomous
89 communities and the village heads to explain the purpose of the study and to solicit their co-

90 operation. The pre-disease survey logistics also involved mobilization of the **community-**
91 **directed distributors (CDDs)** and other village-based field assistants who were involved in
92 the distribution of the drug. The communities selected on the basis of their hyper-endemic
93 status are currently being treated with ivermectin.

94 **Epidemiological and Social Science Method of Data Collection:** Epidemiological and
95 social science methods of data collection were used to collect data on the study objectives
96 and research questions. The study lasted from April to September, 2011. Individuals (men
97 and women) who volunteered and who have been living in the community for over 8 years
98 were interviewed. The rate of compliance was determined on the number of times the drug
99 (ivermectin) was swallowed. Individuals who had taken the drug less than eight times were
100 regarded as low compliers while high compliers were those who had taken the drug for eight
101 or more times

102 **Data collection:** Four instruments were employed in this study, each targeting different
103 sources of information to investigate the research questions. **Since most of the participants**
104 **were illiterates, the recruited field assistants assisted the participants in filling the**
105 **questionnaires. Five hundred and fifty eight** individual questionnaires were properly filled
106 and returned for assessment. The instruments employed were:

- 107 • Annual Treatment Form to obtain information on individual compliance.
- 108 • In-depth Interview Guide with community leaders and community-directed
109 distributors (CDDs) to obtain information on duration of treatment, factors
110 that affect compliance, their willingness to continue the treatment and ways
111 to improve annual and long-term ivermectin treatment
- 112 • Individual Questionnaire to collect information on willingness to continue
113 treatment and ways to improve compliance of community members to
114 annual and long-term ivermectin treatment.
- 115 • Focus Group Discussion Guide to probe the more sensitive issues on
116 disease treatment.

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

123

124 3. RESULTS

125 The effect of demographic factors on compliance rate from household survey is shown on
 126 Table 1. Out of 558 individuals interviewed, 195 (34.9) were males and 363 (65.1%) were
 127 females. Among these groups, 53.8% and 57.3% of males and females respectively were
 128 treated before. Out of the 195 males and 363 females, only 25 (12.8%) males and 45
 129 (12.4%) females were high compliers. However, the Chi-square (χ^2) analysis at 0.05 level of
 130 significance revealed that sex does not affect the rate of compliance to drug (i.e. $\chi^2_{cal.}$
 131 =0.615; *P-value* =0.433),

132

133 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)	Nil	Nil	$\chi^2_{cal.} = 140.486$, <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	

134

135

136 Stratifying by age, the results revealed that out of 558 individuals interviewed, 89 (15.9%)
 137 were between ages 6 -11 years, 67 (12.0%) were between ages 12 – 24 years, while 402
 138 (72.0%) were 25 years and above. Among the ages 25 and above, 289 (71.9%) had been
 139 treated before with 69 (17.2%) as high compliers. Among ages 12-24, only 8 (11.9%) had
 140 been treated before with only 1 (1.5%) high complier. Among the 89 between ages 6-11
 141 interviewed, only 18 (20.2%) had been treated before. The statistical analysis revealed that
 142 age has a great effect on the intake of drug and compliance (i.e. $\chi^2_{cal.} = 140.486$; *P-value* <
 143 0.0001). On education and levels of education, result obtained shows that education and

144 levels of education contributed significantly to the consumption of the drug within the
145 demographic location under statistical investigation (i.e. $\chi^2_{cal}=26.723$; *P-value* <0.0001).

146

147 Of the five hundred and fifty eight individuals interviewed on the factors that positively
148 influence individual compliance to annual ivermectin treatment (Table 2), 459 (82.3%)
149 claimed they “have heard/ seen benefits”, 312 (55.9%) said the influencing factor was “to
150 avoid blindness”, while 170 (30.5%) said “awareness has been created”. Other positively
151 influencing factors include: “to be health”, 137 (24.6%); “it gives energy”, 109 (19.5%) and “to
152 avoid itching”, 94 (16.9%) However, the factors that were detrimental to compliance were
153 “lack of information”, 62 (11.1%); “side reactions”, 38 (6.8%); “non-availability of drug”, 24
154 (4.3%) and “late arrival of drug”, 19 (3.4%).

155

156 **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		

157

158

159

160 On the willingness to continue with ivermectin treatment by most individuals (Table 3), 483
161 (86.6%) out of 558 indicated that most people take the drug; 495 (88.7%) affirmed that most
162 people will continue with the drug while 555 (99.5%) said that they are personally willing to
163 continue with the drug if made available. This is confirmed by Chi-square (χ^2) analysis at
164 0.05 level of significance that most people will continue with the drug ($\chi^2_{cal} =163.585$; *P-*
165 *value*<0.0001).

166

167

168

169

170

171

172

173

174

175

176

177

178

179

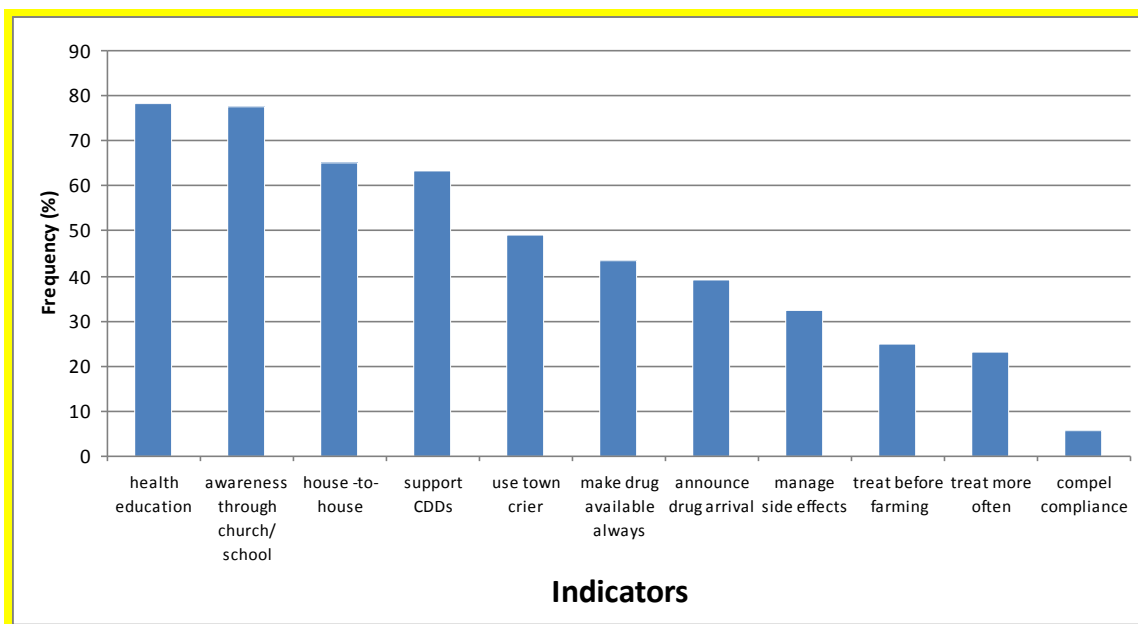
180 **Table 3: Willingness to continue ivermectin treatment among individuals**

Willingness to take drug	Response			Total
	Yes (%)	No (%)	Don't know (%)	
Most people take	483 (86.3)	49 (8.8)	26 (4.7)	558
	511.00	16.33	30.67	
Most people will continue	495 (88.7)	0	63 (11.3)	558
	511.00	16.33	30.67	
Personally willing to continue	555 (99.5)	0	3 (0.5)	558
	511.00	16.33	30.67	
Total	1533	49	92	1674

181 **Testing at 5% significant level; $\alpha = 0.05$; Chi-sq = 163.585; DF = 4; P-value < 0.0001**

182
183
184
185
186

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



191
192
193
194
195
196

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

197 **4. DISCUSSION**

198

199 Results from the demographic survey on households revealed that gender did not affect
200 compliance; however age and the levels of education had great effect on compliance.
201 Findings from the survey revealed that the elderly who were mostly illiterates were available
202 for treatment while the literate adults and youths were away in cities working or schooling.
203 This is supported by an FGD participant who said that the elderly are more in the village
204 while the youths travel outside for work.

205

206 The results also revealed that ‘have heard/seen benefits’ and ‘to avoid blindness’ were
207 major factors that have accounted for the strong willingness of community members to
208 continue annual treatment of ivermectin. However, lack of information resulting from poor
209 mobilization and ignorance is a major factor contributing to low treatment compliance. Lack
210 of information on the availability of Mectizan to the community members was also cited as a
211 major reason for low compliance by (14, 15). Acceptance of Mectizan by individuals depends
212 on the awareness of the individual on the availability of the drug, its effectiveness and
213 benefits accruable to the individual. Therefore, there is the need for people to be aware, get
214 involved and participate in the control programmes. Compliance rate is high in communities
215 where members have reasonable knowledge about *Onchocerciasis* control (The Carter
216 Center River Blindness Program: annual reports/sentinel village evaluation reports, 2002)

217

218 The study also revealed that most people have the knowledge of the drug, hence most of the
219 respondents indicated that ‘most people take the drug’ and are willing to continue. More
220 people are willing to take the tablet than before because the community distributors are part
221 of the community and understand their people better. It is important that government
222 ensures that the drug is available and procured early for distribution. Almost every person
223 interviewed (99.5% of the respondents) said that they are personally willing to continue with
224 the drug as long as the drug is available. It is important that these individuals who are
225 personally willing to take the drug maintain the annual treatment if they desire complete
226 eradication of the disease.

227

228 Suggestions were made on how to improve annual and long-term compliance by
229 respondents. From the findings, ‘health education/enlightenment’ ranked very high (78.3%).
230 This is followed by ‘awareness through church/school’ (77.5%), ‘house-to-house
231 distribution’ (65%) and ‘support CDDs’ (63.3%). (16) also recommended health education
232 as one of the main strategies towards improving treatment. It becomes imperative that the
233 existing health education materials should be reviewed by taking into cognizance those
234 factors associated with low compliance as well as perceptual factors like benefits of

235 treatments and seriousness of the problem of *Onchocerciasis*. Health education materials
236 should emphasize on compliance, particularly among youths and children (5 years and
237 above). Biannual treatment is also recommended to enable those who could not be treated
238 during the first treatment period to be treated later. Economic empowerment of people
239 blinded by onchocerciasis should be emphasized. Such individuals should be encouraged to
240 learn crafts thus reducing the number of beggars on our streets. It is believed that the
241 implementation of these suggestions will not only improve annual compliance to ivermectin
242 treatment but also boost the long-term compliance that will eventually eradicate
243 onchocerciasis in Abia State.

244

245 **5. CONCLUSION**

246

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

258

259 **ACKNOWLEDGEMENTS**

260

261 The study team is grateful to TETFUND for financing this research work. Our gratitude also
262 goes to Abia State Ministry of Health for their technical and moral support.

263

264

265 **AUTHORS’ CONTRIBUTIONS**

266

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

270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

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.”

REFERENCES

APOC/WHO. Report of External Evaluation, 2005. Accessed 15 September 2011.
Available:
http://siteresources.worldbank.org/EXTGLOREGPARPROG/Resources/APOC_indep_eval.Pdf

Edungbola, L.D. (1991). Onchocerciasis control in Nigeria. *Parasitology Today*, 7(5):97-99.

Boussinesq, M., Prod' hon, J and Chippaux, J.P.(1997). *Onchocerca volvulus*: striking decrease in transmission in the Vina valley (Cameroon) after eight annual large scale ivermectin treatments. *Transaction of the Royal Society of Tropical Medicine and Hygiene*, 91:82-86.

Dadzie, K. Y. (1997). Onchocerciasis Control: The APOC Strategy. *African Health*, 19:13-15.

Plaisier, A.P., Alleys, E.S., van Oortmarsen, G.J., Boatman, B.A. and Habbona, J.D.K (1997). Required duration of combined annual ivermectin treatment and vector control in the onchocerciasis control programme in West Africa. *Bulletin of the World Health Organization*, 75(3):237-245.

Borsboom GJ, Boatman BA, Nagelkerke NJ, Agoua H, Akpoboua KL, Alley EW, et al.(2003). Impact of ivermectin on onchocerciasis transmission: assessing the empirical evidence that repeated ivermectin mass treatments may lead to elimination/ eradication in West Africa. *Filarial Journal*. 2003; 2:8 doi: 10.1186/1475-2883-2-8. Accessed 20 September 2011. Available: <http://www.filariajournal.com/content/2/1/8>

Tielsen, J.M., and Beeche, A. (2004). Impact of ivermectin on illness and disability associated with onchocerciasis. *Tropical Medicine International Health*, 9 (4):A45-A56.

310 Amazigo U, Boatin B. The future of onchocerciasis control in Africa. *The Lancet*. 2006:
311 68:1946-1947.
312

313 Amazigo U, Okeibunor JC, Matovu V, Zoure H, Bump J, Seketeli A Performance versus
314 predictors: evaluating sustainability in community-directed treatment project on the African
315 programme for onchocerciasis control. *Journal of Social Science and Medicine*. 2007;
316 64:2070-2082.
317

318 Etya'ale, D. (2001). Vision 2020: Update on onchocerciasis. *Community Eye Health*, 14: 19-
319 21.
320

321 Hopkins, D. Richards, F., and Katarawa, M. (2005). Whither Onchocerciasis control in
322 Africa? *American Journal of Tropical Medicine and Hygiene*, 72 (1): 1-2.
323

324 Winnen, M., Plaisier, A.P., Alley, E.S, Nagelkerke, N.J.D., Van Dortmarsen, G. Boatin, B. A.
325 and Habbema, J.D.F. (2002). Can ivermectin mass treatment eliminate onchocerciasis in
326 Africa? *Bulletin of the World Health Organization*, 80(5): 384-389.
327

328 APOC/WHO. Report of the twenty-ninth session of the technical consultation committee
329 (TCC), Ouagadougou, World Health Organisation/ African Programme for Onchocerciasis
330 Control, 2009. Accessed 20 September 2011
331 Available: http://www.who.int/apoc/about/tcc/TCC/29_final_report_Eng.pdf
332

333 Miri, E. S. (1998). Problems and perspective of managing an onchocerciasis control
334 programmes. A case study from plateau state, Nigeria. *Annals of Tropical Medicine and*
335 *Parasitology*, 92(1): S121-S128.
336

337 Mutabazi, D. and Duke, B. O.L. (1998). Onchocerciasis control in Uganda; how can self-
338 sustaining community-based treatment with ivermectin be achieved. *Annals of Tropical*
339 *Medicine and Parasitology*, 92(2): 195-203.
340

341 Nuwaha, F., Okware, J. And Ndyomugenyi, R. (2004). Predictors for compliance with
342 community- directed treatment ivermectin in Bushenyi District of Uganda: Qualitative
343 Results. *East African Medical Journal*, 18(2):92-96
344
345