

# Spectacle utilisation rate and reasons for non-compliance with wearing of spectacles amongst primary school children in Onitsha, Anambra state, Nigeria



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**Background:** Uncorrected refractive errors (REs) are becoming very common in children in developing countries, yet the use of spectacles and compliance to wear are not well documented in African children.

**Aim:** To determine spectacle utilisation rate and reasons for non-compliance with spectacle wear amongst primary school children.

**Setting:** Primary schools in Onitsha, Anambra state, Nigeria.

**Methods:** A stratified random cluster sampling procedure was used to select children aged 5–15 years in 17 primary schools. A total of 1020 were enumerated – 998 (97.8%) were examined, and 97 (9.7%) had RE (uncorrected visual acuity of 20/40 or worse in both eyes). A questionnaire interview using items derived from the revised Refractive Error Study in Children protocol was used to get information regarding reasons for spectacle wear non-compliance.

**Results:** Of the 97 children with RE, 20 wore their spectacles during the time of study, yielding a spectacle utilisation rate of 20.6%. Eleven (55%) of those wearing spectacles were females, 13 (65%) were myopic and the highest number (50%) of spectacle wearers was in the 8–10 years age category. Age, gender and type of RE were significantly associated with spectacle wear ( $p < 0.05$  was considered statistically significant). The major reasons for non-compliance with spectacles wear were parental disapproval for using spectacles and misconceptions about wearing spectacles.

**Conclusion:** Spectacle utilisation amongst primary school children in Onitsha was low. These findings suggest the need for public awareness about the importance and benefits of wearing spectacles.

**Keywords:** spectacle utilisation rate; spectacle wear; refractive error; school children; non-compliance.

## Introduction

Recent data suggest that many people are visually impaired because of refractive error (RE), as they are not using appropriate refractive compensation.<sup>1</sup> Refractive error is the main cause of visual impairment (VI) in the world, and its correction has been reported to significantly improve visual functioning and quality of life.<sup>2</sup> Refractive errors if left uncorrected in children can lead to amblyopia, which negatively affects their educational, psychological and social well-being.<sup>3</sup> Early assessment of vision in school children facilitates timely correction of RE, if present, which can help improve academic performance and prevent a major proportion of visual disorders, including binocular vision anomalies.<sup>4</sup>

Spectacles are the most cost-effective method for correcting RE globally.<sup>5</sup> In spite of RE being easily correctable with spectacles, only 1.8 billion people globally have access to eye examination and affordable correction.<sup>6</sup> Approximately 500 million people, mostly from developing countries (close to one-third are in Africa), have no access to eye examination and correction, which increase their risk of VI and blindness.<sup>7</sup> The proportion of children who could benefit from spectacle correction, but do not yet own or wear spectacles, has been found to be high in many

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settings: 60% in rural China,<sup>8</sup> 50% in suburban Chile<sup>9</sup> and 49% in native Americans in the western United States of America.<sup>10</sup>

The provision of spectacles is currently a challenge in many developing countries because of issues related to availability and affordability.<sup>6</sup> Studies<sup>1,8,10,11</sup> have shown that globally only one-third or less of children with VI because of RE wear corrective spectacles. Correction of REs is a priority of Vision 2020, but if spectacles are not worn, the efforts to correct REs will not be effective. Hence, every effort should be made to remove obstacles in the availability of spectacles and their use.<sup>12</sup>

Cost, ignorance of refractive status and lack of awareness of a possible solution for reduced vision are identified as reasons for the non-acceptance of recommended corrective spectacles in Nigeria.<sup>13</sup> This is largely attributable to inadequate, in some cases non-existent, eye care services in some parts of Nigeria.<sup>13</sup> In Nigeria, the situation is exacerbated by cultural beliefs that consider use of spectacles by children or young people unacceptable.<sup>14</sup> In spite of the low rates of compliance with spectacle use globally, few studies have been undertaken to investigate the factors that influence wearing of spectacles in children.<sup>15</sup> Available studies on this subject have mainly focussed on amblyopic children and adults after cataract surgery,<sup>16</sup> which are not representative of the population at large. Few studies<sup>17,18</sup> have examined spectacles utilisation and risk factors for non-compliance in children, with most being conducted outside Africa. There is a need for local studies to ascertain the use of spectacles and reasons for non-compliance with wearing spectacles in children in each community, as this varies from one locality to another for a variety of reasons. These include tribal, ethnical, geographical, religious and cultural factors. This study set out to determine spectacle utilisation rate and reasons for non-compliance to spectacle usage amongst primary school children in Onitsha, Anambra state, Nigeria.

## Methods

Information documents were given to the participants, their parents and the various school heads explaining the purpose of the study and the procedures to be followed. Written assent was obtained from every child once their parents had provided written consent. Anonymity was ensured by providing individual codes to all participants before and during the study. The children were informed about the purpose of the study, importance, benefits of the study and their right to decline from participating if they choose to do so. Participants with ocular pathologies were referred to the nearest eye clinic for further assessment and management. The study adhered to the tenets of the Declaration of Helsinki involving human subjects. This was part of a larger study on RE, VI (Refractive Error Study in Children [RESC]) and utilisation of spectacles amongst primary school children in Onitsha, and a detailed methodology has been described

elsewhere.<sup>19</sup> In summary, a stratified random cluster sampling procedure was used to select children aged 5–15 years in 17 primary schools, with 1020 children from 102 clusters being enumerated; of these, 998 (97.8%) were examined and 97 (9.7%) had RE (uncorrected visual acuity [VA] of 20/40 or worse in both eyes).

Demographic data were collected to obtain information about the child's name, age, gender and grade using the RESC form. The information was verified prior to examination with the help of classroom teachers. Ocular examinations, including VA measurements; ocular motility evaluations; and assessment of the external eye, anterior segment, media and retinal fundus, were carried out by utilising VA chart, pen torch and ophthalmoscopy. In addition, retinoscopy, auto-refraction, cycloplegic and subjective refractions were carried out by the researchers. Refractive error was defined as uncorrected VA of 20/40 or less, and the best corrected VA of 20/40 or worse was regarded as VI. Thresholds of 20/40 or less, less than 20/63 and 20/200 or less were used in defining visual categories. Myopia was defined as RE of at least  $-0.50$  diopter (D), hyperopia as  $+2.00$  D or more and astigmatism as  $-0.50$  D or more using subjective refraction, whilst utilisation of spectacles was defined as wearing spectacles at the time of examination.

Utilisation rate of spectacles was determined based on the number of children wearing their spectacles at the time of examination. The researcher noted down all primary school children who wore spectacles at the time of examination. If a child had spectacles but was not wearing them, he/she was considered as 'non-compliant'. Children not wearing spectacles were asked whether they had spectacles with them and to identify from a questionnaire different reasons (one out of eight) for non-compliance. Most of the reasons were formulated following a thorough review of existing literature<sup>1,8,9,10,14,17,18</sup> on the subject. Others were included after the pilot study had identified reasons that were not listed. The children not wearing spectacles at the time of this study were counselled alongside their parents and teachers.

## Data analysis

Data were analysed using SPSS Statistical Package for Social Sciences, version 24. Descriptive statistics and Chi-square tests were used to investigate relationships between age, gender and type of RE with spectacle utilisation;  $p < 0.05$  was considered statistically significant.

## Ethical consideration

The study was approved by the Biomedical Research and Ethics Committee (BREC) of the University of KwaZulu-Natal (BE620/16). Permission to conduct the study in primary schools was obtained from the Department of Education and Training, and the heads of the identified schools in Onitsha, Nigeria. Informed written consent was obtained from parents before examination.

## Results

Of the 998 children examined in the RESC in Onitsha, uncorrected VA of 20/32 or better in the better eye was found in 901 (90.3%) children; 97 (9.7%) children had uncorrected VA of 20/40 or worse in the better eye (Table 1) and 20 (2%) wore spectacles. Visual acuity in 84 (86.6%) children improved to  $\geq 20/32$  in the better eye after refraction, and 13 (13.4%) had the best corrected VA of 20/40 or worse in the better eye, including in one child (1%) with no light perception in one eye. Of the 97 children who had RE, 45 (46.4%) had myopia, 35 (36.1%) had astigmatism and 17 (17.5%) had hyperopia (Table 2). In all, 42 of the 97 (43.3%) children with RE were boys, whilst 55 (56.7%) were girls. Refractive error was highest (45.4%) amongst the children aged 11–13 years and the least common (4.1%) amongst children aged 14–15 years. Refractive error was found to be significantly associated with age (Pearson  $\chi^2 = 13.13$ ,  $p = 0.004$ ) and gender (Pearson  $\chi^2 = 4.17$ ,  $p = 0.04$ ). Myopia was significantly associated with males ( $p = 0.032$ ) but not with age. Astigmatism and hyperopia were not significantly associated with age and gender (all  $p$ -values  $> 0.05$ ). Details of the results regarding the prevalence and distribution of REs have been discussed in the RESC Study in Onitsha.<sup>19</sup>

Of the 97 children with RE, 41 (42.3%) had previously tested their eyes and were prescribed spectacle corrections but only 20 (48.8%) wore them at the time of examination; the spectacle utilisation rate was therefore 20.6% (20/97). Eleven (55%) of those wearing spectacles were girls, 13 (65%) were myopic and children aged 8–10 years had the highest number (10, 50%) of those wearing spectacles. A statistically significant association was found between age, gender, type of RE and use of spectacles (all  $p$ -values  $< 0.05$ ; Table 3). Amongst those not wearing their spectacles, the majority (28.6%) reported that their parents disapproved the use of spectacles. Other reasons for non-compliance with spectacles wearing are presented in Table 4.

## Discussion

The present study showed that spectacle utilisation rate amongst children in Onitsha was 20.6%. This could be because of poor awareness about the use of corrective spectacles for RE and low uptake of RE services in Onitsha. It is worth noting that 95.7% of children with RE in this study had improved vision after refraction and provision of spectacles. Interestingly, none of the 1707 children examined in a study conducted in Ile-Ife in south-west of Nigeria<sup>20</sup> had previously had an eye examination. This could be because

Ile-Ife is a semi-urban area with few eye care service providers and people are of lower socio-economic status. Muma et al.<sup>21</sup> also found only one child wearing spectacles in their study in the rural area of Kenya. This result could be explained by inaccessibility and the high cost of eye care services as well as the social stigma associated with wearing spectacles. A recent study<sup>22</sup> conducted in Nigeria showed utilisation of spectacles to be highest in the north-west region.

**TABLE 2:** Age and gender distribution of refractive errors.

Variables	Myopia		Astigmatism		Hyperopia		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Gender</b>								
Male	28	62.2	14	40.0	5	29.4	42	43.3
Female	17	37.8	21	60.0	12	70.6	55	56.7
<b>Age (years)</b>								
5–7	6	13.3	1	2.9	8	47.1	15	15.5
8–10	15	33.3	14	40.0	5	29.4	34	35.1
11–13	22	48.9	19	54.0	3	17.6	44	45.4
14–15	2	4.4	1	2.9	1	5.9	4	4.1
<b>Total</b>	<b>45</b>	<b>46.4</b>	<b>35</b>	<b>36.1</b>	<b>17</b>	<b>17.5</b>	<b>97</b>	<b>100.0</b>

**TABLE 3:** Spectacles utilisation by age, gender and type of refractive error ( $n = 20$ ).

Variables	Use of spectacles ( <i>n</i> )	Percentage (%)	<i>p</i>
<b>Age (years)</b>			
5–7	3	15	0.0435
8–10	10	50	
11–13	6	30	
14–15	1	5	
<b>Gender</b>			
Male	9	45	0.0460
Female	11	55	
<b>Type of RE</b>			
Myopia	13	65	0.0042
Astigmatism	5	25	
Hyperopia	2	10	
<b>Total</b>	<b>20</b>	<b>100</b>	-

RE, refractive error.

**TABLE 4:** Self-reported reasons for non-compliance with spectacles wearing among those subjects who reported having been prescribed spectacles previously ( $n = 21$ ).

Reasons for non-compliance	<i>n</i>	%
Parents disapprove use of spectacles	6	28.6
Concerned or teased about appearance	3	14.3
Forgot spectacles at home	3	14.3
Spectacles cause headaches	2	9.5
Do not feel spectacles are needed	2	9.5
Children should not wear spectacles	2	9.5
Use spectacles at special times or occasions	2	9.5
Spectacles will sink in the eye sockets	1	4.8
<b>Total</b>	<b>21</b>	<b>100.0</b>

**TABLE 1:** Distribution of uncorrected, presenting and best corrected visual acuity.

VA category	Uncorrected VA		Wearing spectacles		Presenting VA		Best corrected VA	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
$\geq 20/32$ in both eyes	891	89.3	0	-	891	89.3	980	98.2
$\geq 20/32$ in one eye only	10	1.0	0	-	30	3.0	5	0.5
$\leq 20/40$ to 20/63 or better in the better eye	58	5.8	7	0.7	51	5.1	11	1.1
$\leq 20/80$ to 20/160 or better in the better eye	35	3.5	10	1.0	25	2.5	2	0.2
$\leq 20/200$ or worse in the better eye	4	0.4	3	0.3	1	0.1	0	0.0
<b>Total</b>	<b>998</b>	<b>100.0</b>	<b>20</b>	<b>2.0</b>	<b>998</b>	<b>100.0</b>	<b>998</b>	<b>100.0</b>

VA, visual acuity.

Megbalayin,<sup>22</sup> in a study to determine barriers to spectacle utilisation amongst undergraduates in Akwa-Ibom state, Nigeria, found that only six (9.8%) out of 81 students with RE were wearing spectacles at the time of examination. The author further revealed that students with headaches, tearing and with both parents wearing spectacles were more likely to use spectacles. Similar findings were reported by Faderin and Ajijeoba<sup>23</sup> in Lagos, Nigeria. The authors reported that poor awareness of eye problems and benefits of spectacles usage amongst parents not wearing spectacles could account for parental disapproval of spectacles usage in their children. Variations in the findings could be attributed to the fact that Onitsha is a relatively affluent area with easy access to eye care services and people are of a higher socio-economic status than those in Ile-Ife.

However, the spectacle utilisation rate of 20.6% found in the current study is lower than 35.8%, 42.3% and 93% recorded in China,<sup>24</sup> Egypt,<sup>25</sup> and India,<sup>12</sup> respectively. However, it is considerably higher than what was reported in other studies carried out in Iran,<sup>26,27</sup> Chile,<sup>28</sup> Kenya<sup>21</sup> and South Africa<sup>29</sup> (Table 5). Variations in spectacle utilisation rates in these studies could be attributed to racial/ethnic differences, targeted population, access to eye care services, type of RE prevalent in that area, cultural beliefs regarding use of spectacles and the cost of spectacles. For example, the low utilisation rates recorded in Chile<sup>28</sup> and Iran<sup>26,27</sup> could be because of high cost of spectacles in those countries, whilst poor access to eye care services and cultural beliefs could be responsible for the lower utilisation rate in Kenya. In addition, the spectacle utilisation rate of 93% reported in India<sup>12</sup> could be because the community mobilisers employed in the study were working very close with the community and might have given some prior information to the community about the study, resulting in a very high compliance rate. In addition, the study did not find any evidence of parental disapproval or stigma associated with wearing spectacles, although it was evident that liking or

disliking spectacles and the style of spectacles were more important for children than adults. The study further suggested that communication campaigns involving popular images and role models are important in influencing children's behaviour and compliance in wearing spectacles.

Use of spectacles was found to be significantly associated with boys aged 5–7 years and those with myopia (all  $p$ -values < 0.05; Table 3). A study conducted in Akwa-Ibom, Nigeria, found that all the students wearing spectacles were males;<sup>22</sup> this is contrary to the findings of Alex et al.,<sup>30</sup> who found that females had a greater tendency to wear spectacles than their male counterparts. Marmamula et al.<sup>31</sup> also reported that spectacles wearing rate was higher in women than in men (35% vs. 24%). Adefule-Ositelu<sup>32</sup> noted that women aged 15–18 years wore spectacles for fashion, whilst men wore them based on the severity of RE, and not because of fashion. Fotouhi et al.<sup>26</sup> and Hashemi et al.<sup>27</sup> reported in their studies carried out in Iran that utilisation of spectacles is associated with age and gender. Variations in the findings reported could be because of differences in culture, geographical locations, race and socio-economic factors. Moreover, the current study was a school-based study and had a sample size of 998 examined children, whilst those completed in Tehran<sup>26</sup> and two underserved rural areas of Iran<sup>27</sup> were population-based research with sample sizes of 4353 and 3314, respectively.

A study conducted in Nigeria showed that factors affecting spectacles wearing were complex.<sup>22</sup> In this study, 20 (20.6%) children wore spectacles at the time of examination, although 21 (21.6%) others reported being prescribed spectacles but were not wearing them. Our study found that parents disapproved wearing spectacles in their children, which was the major reason reported for non-compliance with spectacles wearing. Similar findings were recorded in Saudi Arabia,<sup>4</sup> the United States of America,<sup>33</sup> India<sup>34</sup> and Tanzania.<sup>35</sup> The findings of our study also showed that children did not comply with spectacles wearing because of being teased about their appearance by fellow students, forgetting spectacles at home or that spectacles cause headaches. Concern over appearance or being teased in the class was reported as the main reason for non-compliance with spectacles wearing in the studies conducted in Mexico,<sup>18</sup> the United States of America,<sup>33</sup> Iran,<sup>26,27</sup> South Africa,<sup>29</sup> Ghana,<sup>36</sup> Oman,<sup>37</sup> Saudi Arabia,<sup>4</sup> China<sup>38</sup> and India.<sup>39</sup> This observation could be because of the stigma attached with wearing spectacles and the belief that their use eventually leads to blindness.<sup>40</sup> Some children in the current study reported that spectacles should not be worn by children and, if necessary, they should be used occasionally or for special occasion because of fear of spectacles sinking their eyes. Nwosu<sup>41</sup> reported claims of the deleterious effects of spectacles on eyes, such as sunken eye sockets and ocular discomfort (headaches), with the use of corrective lenses as a major reason given by respondents for not wearing prescribed spectacles in his study carried out in Nigeria. Castanon Holguin et al.<sup>18</sup> stated that about one-quarter (16%) of children forget their spectacles at home and use them

**TABLE 5:** Selected studies on spectacle utilisation in children in different countries.

Study	Year	Country	Spectacle utilisation rate (%)
Naidoo et al. <sup>29</sup>	2003	South Africa	2.7
Ajaiyeoba et al. <sup>42</sup>	2006	Nigeria	3.0
Kumah et al. <sup>36</sup>	2013	Ghana	3.4
Muma et al. <sup>21</sup>	2009	Kenya	3.4
Muthu et al. <sup>43</sup>	2015	India	7.4
Hashemi et al. <sup>27</sup>	2017	Iran	7.7
Fotouhi et al. <sup>26</sup>	2006	Tehran	9.3
Fahd et al. <sup>44</sup>	2013	Saudi Arabia	9.4
Barria et al. <sup>28</sup>	2018	Chile	9.6
He et al. <sup>8</sup>	2014	China	15.5
Khandeker et al. <sup>34</sup>	2008	India	19.0
Semanyezi et al. <sup>1</sup>	2015	Rwanda	26.7
Golgate et al. <sup>34</sup>	2013	India	29.5
Aldebasi et al. <sup>4</sup>	2013	Saudi Arabia	33.2
Qian et al. <sup>24</sup>	2018	China	35.8
Mohammed et al. <sup>25</sup>	2014	Egypt	42.3
Khandeker et al. <sup>37</sup>	2002	Oman	50.0
Spectacles compliance report <sup>12</sup>	2019	India	93.0



occasionally. Measures to improve wearing of spectacles for refractive correction in children should be carried out effectively through educational and awareness campaigns. Parents should also be involved in these programmes, and schools should conduct follow-up visits after school screening programmes.

Fotouhi et al.<sup>26</sup> and Hashemi et al.<sup>27</sup> found that age, gender, and type of RE influenced non-compliance with wearing of spectacles. Castanon Holguin et al.<sup>18</sup> in Mexico also found that non-compliance with wearing of spectacles was higher amongst older children and those in urban areas. The authors reported that older urban-based children were more likely to list concerns about their appearance after wearing spectacles and being teased than their younger and rural counterparts. This could be related to our study, as only one child (5%) aged 14–15 years was wearing spectacles. Thirteen (65%) children who wore spectacles in our study were myopic, indicating that myopic children were more likely to comply with spectacles wearing than those with astigmatism or hyperopia. This could be because myopes wear spectacles to correct their distance vision unlike hyperopes, who still manage to see at a distance without corrective spectacles because of their accommodative ability. This is similar to the findings reported by Hashemi et al.<sup>27</sup> in Tehran, where 74.5% of those wearing spectacles were found to be myopic. Although children with hyperopia are less likely to comply with spectacles wearing, they are more at risk of developing strabismus and amblyopia. Strategic measures should be devised to reduce non-compliance with wearing of spectacles in school children.

The results of this study must be considered within the context of certain limitations. For example, a major limitation of this study was the small non-probability sample which precluded the use of higher-order statistical analysis. The study involved only children in the city of Onitsha, and therefore the findings cannot be generalised to the entire population of children in Nigeria. Another limitation was that the measure of compliance was based only on whether the participants presented wearing spectacles on the day of eye examination, and the reasons for non-compliance with spectacles wearing were obtained from participants' self-report. A further limitation is that the study did not investigate cultural attitudes and the role of teachers regarding spectacles wearing. In addition, children who were absent from school were excluded from the study.

## Conclusion

Spectacle utilisation rate was relatively low (20.6%), and parental disapproval of the use of spectacles was the major reason for non-compliance in this study. These highlight the need for awareness programmes about the use of corrective spectacles in school health and education programmes. These would help to prevent the negative impact of RE and VI on children's education and development. Compliance with spectacles wearing could be improved by educating the parents and their children about the importance of wearing spectacles.

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The authors have declared that no competing interests exist.

## Authors' contributions

All authors contributed equally to this work.

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## Data availability statement

Data sharing is not applicable to this article.

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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