Identification of Risk Factors for Myopia Questionnaire in the Malay Language among Primary School Children in Malaysia

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ABSTRACT

Introduction: This study aimed to develop a questionnaire in Malay language for the identification of risk factors for myopia among primary school children aged 10 to 12 years old in Malaysia. **Materials and Methods:** The study commenced in October 2012 till Julai 2013 in two main phases. The first phase was a pilot study for the construction of questionnaire items by literature review and discussion with the experts. A total of 103 parents of primary school children were randomly selected to test the comprehensibility of the preliminary questionnaire. The second phase was the actual study which involved parents of 353 primary school children , 132 were parents whose children were myopes and 221 parents whose children were non-myopes. **Results:** Discussions with experts in human vision science identified 5 main domains and 71 items for the preliminary questionnaire. A total of 55 items were retained for the actual study phase in view of statistically good correlation (r = 0.4 and above). Predictive validity by chi-square test allowed 28 items to be retained because of significant association with myopia (p <0.05). The correlation coefficient of test-retest reliability result was considerably good (r = 0.765) and the validity in 2 categories of risk for myopia showed highly significant predictive validity of the questionnaire (p = 0.000). **Conclusion:** The developed Malay language questionnaire has good reliability and validity to identify the risk factors for myopia among primary school children in Malaysia.

KEYWORDS: myopia, primary school children, questionnaire development, reliability, validity.

INTRODUCTION

Myopia is a major issue concerning problems of refractive errors among children in Asian countries[1]. The prevalence rates of myopia are high with increasing trend every year in countries such as Taiwan, Japan, Hong Kong and Singapore [2,3]. In Malaysia, the prevalence of myopia among 7 years old children was 9.8% and increased to 34.4% by 15 years old[4]. Genetic and enviromental factors are the two major etiological factors for myopia[5,6]. Identifiying factors that may contribute to the occurrence and progression of myopia is essential to develop strategies for successful preventive measures.

Questionnaires are gaining popularity as instruments used for collecting health-related information in clinical research and studies because of its simplicity and covenience[7]. However, a reliable and valid questionnaire for the identification of risk factors for myopia among the primary school children is still not available in Malaysia. As the Malay language is the main language of instruction in schools, therefore the language of the questionnaire should be in the Malay language[8]. Thus, a cross-sectional study was designed to develop a reliable and valid questionnaire which could be used as an instrument for early identification of locally appropriate risk factors for myopia among the primary school children in Malaysia. In this study, the major ethnic groups including Malay, Chinese and Indian were selected to address issues concerning the socio-cultural diversity, linguistic and lifestyle of the three main ethnic groups in Malaysia.

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MATERIALS & METHODS

The process of developing this questionnaire was conducted in two main phases. The first phase was a pilot study to test its comprehensibility and the second phase was the actual study to determine its reliability and validity. The first phase was initiated by items generation done by collecting and building supporting details from well-established reliable and valid set of questionnaires from studies done in other countries. The items identified were verified by discussion with the local experts in the field of human vision science and psychology. The preliminary questionnaire in Malay language was constructed and underwent a comprehensibility testing in the pilot study. The self-administered questionnaire was distributed to 103 parents of school children from primary schools in Kuala Krai, Kelantan. All the primary school children also had their refractive status concurrently assessed in the Eye Clinic of Hospital Kuala Krai, Kelantan. Following the pilot study, the questionnaire was further refined by the experts to improve its reliability and validity before proceeding to the actual study.

The second phase was the actual study where the developed self-administered questionnaire was allocated to 353 parents of known myopic and non-myopic Malay, Indian and Chinese primary school children aged between 10 to 12 years old. They were identified by clustered random sampling from primary schools in Klang District of Selangor. Parental consent for every child was obtained for this study. This research followed the tenets of Declaration of Helsinki and was approved by the Research and Ethical Committee of University Kebangsaan Malaysia Medical Centre in collaboration with the Ministry of Education Malaysia. All subjects underwent visual acuity examination using the logMAR EDTRS chart. The positive predictive value of uncorrected visual acuity level equal or worse than 0.3 logMAR was used as the cut-off point for further eye examination by retinoscopy and subjective refraction. The Malay language questionnaire was further refined and finalised by measuring its reliability using test-retest methodology and by determining its predictive validity. The steps are summarised as below:

Step 1: Item generation

The generation of items for development of the questionnaire required a considerable pilot work to refine the items' wordings and contents. The items on risk factors for myopia were generated from systematic review of current literature and the existing well-established questionnaires which include the Sydney Myopia Study[9], the near work and myopia study in Singapore[10] and the study on refractive error among suburban Malay in Malaysia[11]. The discussion with a panel of experts in human vision science and clinical psychology was to ensure its face or content validity.

Step 2: Development of preliminary questionnaire

The preliminary questionnaire was developed for every item by the panel of experts. The questions were formulated in an easily understandable Malay language, using simple words and by quoting the appropriate activities. A preliminary Malay language questionnaire was produced following repeated discussion, checking and rechecking, and exchanging ideas with the experts.

Step 3: Determination of comprehensibility, test-retest reliability, content validity and predictive validity

This step was accomplished through successive tests of comprehensibility, test-retest reliability and validity measurements. The expert committee met and analysed the test results upon the completion of every test. Poorly performed questions were either rephrased or deleted to improve the reliability and validity of the subsequently developed questionnaire.

Comprehensibility

The comprehensibility testing was performed in the 2 stages of pilot study done in Kuala Krai, Kelantan. In the first pilot study, randomly selected 39 primary school children aged 10 to 12 years from the 3 ethnic groups were recruited. They were given the self-administered preliminary questionnaire to be answered by their parents. The parents were encouraged to express their concerns regarding the difficulties, confusion, and time allocation for every item in the questionnaire to determine the comprehensibility level of the questions. Questions with poor level of comprehensibility were then either deleted or rephrased. In the second pilot study, the improved questionnaire was distributed to another randomly selected 64 primary school children of similar characteristics. Similar procedure was applied to further test the comprehensibility of the questions. The results were used to select the subsequent set of questionnaire with improved comprehensibility for the actual study.

Test-retest reliability

The actual study involved 353 parents of school children from primary schools in the Klang district of Selangor, Malaysia. They were identified by cluster random sampling and the district has urban population with good representation of the Malay, Chinese and Indian ethnic groups. The parents of the first 100 children who completed the questionnaire were given the same set of questionnaire after 45 days for the retest. The interval was to minimise the familiarity effect of the participants. A pair of complimentary glasses was given to those who returned the second questionnaire as a strategy to motivate them. The test-retest reliability was estimated by calculating the correlation coefficient of the two consecutively administered questionnaire results.

Validity

The validity of the questionnaire was performed to differentiate myopia from non myopia with reference to categories of the total point scored (*1-no risk, 2-at risk*). The chi-square test was performed to determine the significance of predictive validity. Prior to the chi square test, ROC curve analysis was performed to choose the cut off point score of the questionnaire.

Step 4: Finalization of the questionnaire

Following the repeated comprehensibility, reliability and validity testing, and the rejection of

Table I: Items identified in the 5 main domains.

Part 1 (Domain 1: Near work)

Gadgets available at home
1. Hand phone
2. Computer/ laptop
3. Internet access
4. I-pad
5. Digital camera
6. Game (Playstation, hand-held game etc.)
7. DVD player

Time spend doing near work
8. Duration of formal school
9. Duration of additional class in weekdays
10. Duration of additional class in weekend
11. Duration of doing homework
12. Duration of watching TV
13. Duration of using computer

Amount of reading
14. Amount the homework that can be finished
15. Amount magazine/story book that can be finished

Concerns of parent about near work induced myopia
16. Near work can induce myopia
17. Child put her face close to the book while writing
18. Child keeps her face close to the book while reading
19. Child used hand phone to play game
20. Child wears the spectacle
21. Child remove the spectacle while reading or writing
22. Child complains of headache when reading or writing
23. Child sleeps in front of TV

Distance
24. The distance at which the child needs reading or writes
25. The distance at which the child watches television

Lighting
26. Type of home lighting when child reads, write etc.at night
27. Type of room light (fluorescent light or reading lamp)

Activity during weekdays and weekends
28. Child's activity at school
29. Child's activity during school holidays

Part 2 (Domain 2: Family history)
30. Father wearing the spectacle
31. Mother wearing the spectacle
32. Both parents wearing the spectacle

the questionnaire with poor score, the remaining questionnaire were selected and developed as the final set of questionnaire in Malay language. This will be the valid and reliable set of Malay language questionnaire for the identification of risk factors for myopia among primary school children in Malaysia.

RESULTS

Items generated and applied in the first pilot study

Items that were identified as the possible risk factors to myopia were categorised in 5 main domains namely, 1-near work,[12,13,14,15,16,] 2-family history,[4,15,16,17,18,19,20,21] 3-socioeconomic status, [2,9,22] 4-outdoor activities[6,23,24,25], and 5-diet[26,27]. A total of 72 items were initially generated (Table I).

33. Grandfather (paternal side) wearing spectacle
34. Grandmother (paternal side) wearing spectacle
35. The sibling wearing spectacle

Part 3 (Domain 3: Socioeconomic status)
36. Name of parent
37. Relationship with the child
38. Address
39. Phone number
40. Father's occupation
41. Marital status
42. Race (Father)
43. Father's education level
44. Monthly income
45. Mother occupation
46. Parent's origin (rural/urban)
47. Mother education level
48. Race (Mother)
49. Housing type
50. Type of home

Part 4 (Domain 4: Outdoor activities)
Types of outdoors activities
51. Sepak takraw
52. Self-defense arts
53. Football
54. Volleyball
55. Netball
56. Swimming
57. Presses
58. Participate in religious activities
59. Fishing

Time playing outdoor
60. Hour that child take to playing outdoor
61. Hour that child take to playing during school holidays

Part 5 (Domain 5: Diet)
62. Frequency of eating bread per day
63. Frequency of drinking fruit juice per day
64. Frequency of eating fruits per day
65. Frequency of taking cheese or yogurt per day
66. Frequency of eating rice/ vermicelli/ noodles per day
67. Frequency of eating meat per day
68. Frequency of eating fish or chicken per day
69. Frequency of eating legumes per day
70. Frequency of taking eggs per day
71. Frequency of taking meat product (such nugget, sausage etc.) per day
72. Frequency of drink carbonated water (such as PEPSI, COKE etc.) per day

Adaptation of the pre-final versions
Comprehensibility
In the first pilot study, from the 39 primary school children recruited, 48.7% (n=19) were diagnosed as myopes and 51.3% (n=20) were diagnosed as non-myopes. Their parents were asked to answer the questionnaire in front of the interviewer. There were 56.41% (n=22) primary school children aged 12 years old, 12.82% (n=5) aged 11 years old and 30.76% (n=12) aged 10 years old. A total of 41.03% (n=16) of the primary school children were Malay, 33.3% (n=13) were Indian and 25.64% (n=10) were Chinese.
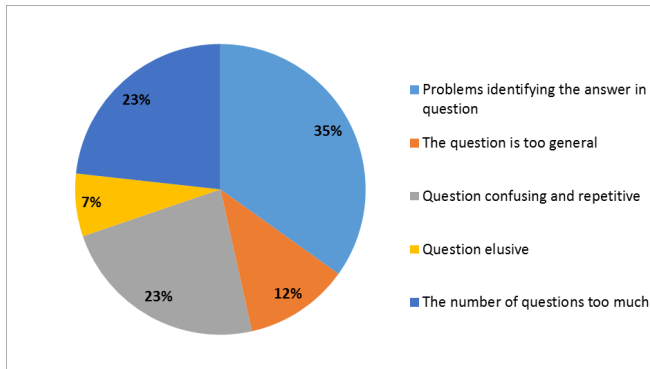

Figure 1. Comments from parents regarding questionnaire

In view of the many comment from parent regarding the questionnaire from the first stage pilot study (Figure 1), the second pilot study was done. In the second pilot study, a random sample of 64 primary school children were recruited, of which, 51.6% (n=33) were diagnosed as myopes and 48.4% (n=31) were non-myopes. The parents of these children completed the questionnaire in the presence of the interviewer. There were 65.6% (n=42) primary school children aged 12 years old, 17.2% (n=11) aged 11 years old and 17.2% (n=11) aged 10 years old. A total of 54.7% (n=35) of the primary school children were Malay, 25.0% (n=16) were Indian and 20.3% (n=13) were Chinese. Following the second pilot study, a total of 55 items were retained because of good correlation with the main domain (r = 0.4 and above) (Table II).

Table II: Items retained in the 5 domains of the questionnaire

Part 1 (Domain 1: Near work)

Gadgets available at home
1. Computer/ laptop
2. Internet access
3. I-pad
4. Digital camera

Time to spend doing near work
5. Duration of formal school
6. Duration of additional class in weekdays
7. Duration of additional class in weekend
8. Duration of doing homework
9. Duration of watching TV

Concerns of parent about near work induced myopia
10. Near work can induce myopia
11. Child put her face close to the book while writing

12. Child keeps her face close to the book while reading

Distance
13. The distance at which the child needs reading or writes
14. The distance at which the child watches television

Lighting
15. Type of home lighting when child reads, write etc.at night

Part 2 (Domain 2: Family history)

16. Father wearing the spectacles
17. Mother wearing the spectacles
18. Grandfather (paternal side) wearing spectacles
19. Grandmother (paternal side) wearing spectacles
20. Grandfather (maternal side) wearing spectacles
21. Grandmother (maternal side) wearing spectacles
22. The sibling wearing spectacles

Part 3 (Domain 3: Socioeconomic status)

23. Name of parent
24. Relationship with the child
25. Address
26. Phone number
27. Father's occupation
28. Marital status
29. Race (Father)
30. Father's education level
31. Monthly income
32. Mother occupation
33. Parent's origin (rural/urban)
34. Mother education level
35. Race (Mother)
36. Housing type
37. Type of home

Part 4 (Domain 4: Outdoor activities)

Types of outdoors activities
38. Badminton
39. Football
40. Volleyball
41. Swimming
42. Presses
43. Participate in religious activities
44. Fishing
45. Basketball

Time playing outdoor
46. Hour that child take to playing outdoor
47. Hour that child take to playing during school holidays

Part 5 (Domain 5: Diet)

48. Frequency of eating fruits per day
49. Frequency of taking cheese or yogurt per day
50. Frequency of eating rice/ vermicelli/ noodles per day
51. Frequency of eating meat per day
52. Frequency of eating fish or chicken per day
53. Frequency of taking eggs per day
54. Frequency of taking meat product (such nugget, sausage etc.) per day
55. Frequency of drink carbonated water (such as PEPSI, COKE etc.) per day

In the actual study, parents of the randomly selected 353 Malay, Chinese and Indian primary school children, were given a self-administered questionnaire to be completed at home. Among them, 37.4% (n=132) were parents of children with myopia and 62.6% (n=221) were parents of children who were non-myopes. There were 34.6% (n=122) primary school children aged 12 years old, 35.1% (n=124) aged 11 years old and 30.3% (n=107) aged 10 years old. The total percentage of Malay primary school children was 29.2% (n=103), Chinese was 51.6% (n=182) and Indian was 19.35% (n=68). The reliability and validity of the questionnaire was tested in the actual study.

Reliability study
The reliability study was performed using the test-retest methodology. The correlation coefficient was 0.765. (Table III)

TABLE III: Reliability of the reports from 100 parents to children aged 10 to 12 years old.

	Pearson Correlation (95% CI)	n	p
Total score (First test and retest)	0.765	100	0.0001

Predictive Validity

In the actual study, the validity of the questionnaire was determined by using predictive validity evidence. A total of 28 items were found to be significant and we decided to retain them in the final version of the developed questionnaire. Predictive validity were based on the total score of the items remained in the final questionnaire and were divided into 2 categories namely, at no risk and at risk, against the group of primary school children with myopia and non-myopia. The cut-off score of 11 had the highest sensitivity (91.7%) and specificity (52%). Table IV shows the sensitivity and specificity of 3 different cut-off points from ROC curve analysis.

Table V showed the proportion of myopic and non-myopic primary school children at 2 different risk categories. The Chi-square test showed that the risk categories was associated with myopia. The predictive validity of the questionnaire for myopia and non-myopia were highly significant statistically for the 2 risk categories (χ^2= 68.77, df=1, p = 0.000).

Table IV: Sensitivity and specificity of 3 cut-off scores from ROC curve analysis

Cut-off score	Sensitivity (%)	Specificity (%)
10.0	94.7	38
11.0	91.7	52
12.0	84.8	60.2

Table V: Proportion of myopic and non-myopic school children at 2 different risk categories

Risk category (score)	Myopia primary school children	Non-myopia primary school children
No risk (< 11)	11 (8.3%)	115 (52.0%)
At risk (>= 11)	121 (91.7%)	106 (48.0%)

DISCUSSION

The use of questionnaires is a common practice in healthcare research and most questionnaires were developed in English-speaking countries.[7] Malaysia is a multiracial country and the national language is Malay. Therefore, the questionnaire should be in the Malay language for it to be applicable to everybody in the country. The original English version could not be tested for its comprehensibility and validity to everyone in Malaysia. This study has successfully developed the first set of questionnaire in Malay language as the standardised instrument with significant reliability and validity to identify the risk factors for myopia among all primary school children in Malaysia. This work will greatly contibute to solving the major issues concerning the risk factors for myopia in Malaysia.

We have examined the questionnaire developed by its predictive validity, comprehensibility and reliability test. The developed questionnaire is confirmed valid and reliable to evaluate the risk factors for myopia among the 3 major ethnic groups of primary school children in Malaysia, and probably also for the whole of Malaysia. In our study, the larger sample size of 353 has allowed the measurement of predictive validity. The predictive validity has allowed the determination of risk for myopia according to the total score acquired from the questionnaire developed. A cut-off point score of 11 has given the highest sensitivity (91.7%) and specificity (52.0%). Our questionnaire has the ability of 91.7% to correctly identify schoolchildren with myopia.

The specificity was relatively low (52.0%) because of our myopia definition of -1.00D in the study. If the definition of -0.25D was used, then the specificity would increase. This method of using a questionnaire will save time and expenditure in conducting additional research and surveys. Our reliability testing was done on a large sample of 100 with longer time interval of 45 days to avoid recall memory between the first test and the retest with high correlation coefficient of 0.765. Saw et al (1999) in Singapore only had the reliability test done on 30 sample and the time interval from first test and second test was only 2 week and the correlation

coefficient was 0.55. They determined the validity by measuring the distance for different activities in the clinic by comparing the answer given by the parent to the result they get from measuring in the clinic in only 57 samples.[6]

In this study, 5 main domains of risk factors for myopia were investigated which include near work, family history, sosioeconomic status, outdoor activity and diet. Many researchers are looking into the near work induced myopia and the developed questionnaire will also be capable of looking into this major and current issue.[5] As this will be the only and prime questionnaire to be used in Malaysia, any shortfalls and restrictions shall be identified, improved and perfected accordingly for future use to benefit the coming generations in Malaysia.

CONCLUSION

The developed questionnaire for the identification of risk factors for myopia among primary school children in Malaysia is proven valid and reliable instrument. This is only the preliminary study for the developed questionnaire. Further exploitation and utilisation of the questionnaire in future studies is required to improve and optimise its advantages and benefits.

ACKNOWLEDGEMENT

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