PEER REVIEW HISTORY

BMJ Paediatrics Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Is it appropriate to use World Health Organization Multi-centre Growth Reference Study standards to assess the growth parameters of Sri Lankan babies?- A single centre cross-sectional study
AUTHORS	Abeyagunawardena, Ishanya; Abeynayake, Arundhi; Anuththara, Thushani; Alawaththegama, Kasun; Amanda, Sakuni; Abeyrathne, Vishaka; Amaradasa, Prabhadi; Anuradha, Buddhika; Ahmed, Hanan; Abeykoon, Chathupa; Fernando, Dinesh Malcolm Gerard

VERSION 1 - REVIEW

REVIEWER	Hermanussen, M Aschauhof, Altenhof, Germany Competing interests: none
REVIEW RETURNED	23-Jul-2017

GENERAL COMMENTS	The authors compared birth weight, length and occipito-frontal circumference of newborns in a tertiary care hospital in Sri Lanka, with World Health Organization (WHO) standards. They also obtained data on maternal pre-pregnancy weight, maternal education, and parity. This is a very interesting paper. It is short, clearly written, and it discusses the problem of so-called global standards for child height/length and weight in countries with discrepant local references. The authors are not alone with this problem. WHO standards are inappropriate not only for Asian populations (who are generally shorter and lighter), but also for European populations (who are generally taller and heavier), and not only at birth, but also at other age groups. In order to highlight that the "Sri Lanka problem" is an all-Indian problem, the authors might want to cite e.g. [Subramanyam MA, Ackerson LK, Subramanian SV. Patterning in birthweight in India: analysis of maternal recall and health card data. PLoS One 2010;5:e11424] and also comment on the WHO Indian sub-sample. Also the WHO Indian sample is shorter and lighter. Many papers have already dealt with the inappropriateness of WHO standards for particular populations. This is not new. But the authors succeeded in presenting a very concise way of showing this inappropriateness for their "home-sample" by a precisely done short 4 week-study. This type of study can set a benchmark for others who are similarly unhappy with WHO standards. The authors should also present weight (and BMI) of mothers both before pregnancy and the weight gain during pregnancy. This may be done as a table (or a scattergram). It is important to clearly show the lack of association between maternal educational level and child birth measures because the general notion still persists assuming that low birth weight and length are caused by poor maternal

educational/health/nutritional circumstances.

In view of the differences between WHO standards and the local reality, the authors should discuss possible solutions to this dilemma. Constructing national growth charts from large data sets are one possibility, but such charts are painstaking and costly. So-called synthetic growth references have alternatively been proposed [Hermanussen M, Stec K, Aßmann C, Meigen C, Van Buuren S. Synthetic growth reference charts. Am J Hum Biol. 2016 Jan 2;28(1):98-111].

REVIEWER	Nanayakkara, K. K. Suwasevana Hospital 532, Peradeniya Road Kandy Sri Lanka Competing interests: None
REVIEW RETURNED	24-Jul-2017

GENERAL COMMENTS	1. In Sri Lanka previous studies show that birth weights differ with ethnicity , with the Moor (Muslim) community experiencing a higher birth weight nearing Caucasian standards. Would it be possible to categorize birth weights according to ethnicity ? 2. Earlier studies show birth parameters differing with parity , with a higher birth weight in the second pregnancy and again increasing after the fifth. Please recheck 3. Eliminate correlating IUGR with birth weight as many other factors are responsible for its patho-physiology

REVIEWER	de Sivla, Harendra Sri Lanka College of Paediatrics Sri Lanka Competing interests: None
REVIEW RETURNED	28-Jul-2017

GENERAL COMMENTS	I would start by stating that this is a commendable project considering the researchers being 3rd year medical students. Peradeniya/Kandy are small areas compared to Sri Lanka. The LBW rate in the Central Province (and some other areas) is high. The distribution of Ethnic groups could also vary. Therefore it is difficult to equate it to the rest of the country. The mother's pre pregnancy weight would have been very inaccurate since many women especially in lower social strata would not weigh themselves regularly, the instruments used would vary a great extent. The weight may be taken at the maternity clinics in varying settings with varying facilities and accuracy at different timesof pregnancy. The mothers height/childhood stunting could have been taken more accurately by the researchers that would have had a relevance. They may already have it although not used. The Birth Weight of mothers may also have been relevant although its accuracy also may also be unreliable. Since the mother's educational level has been used, the categorization is not clear. Many may go up to a particular class but automatic promotion may hinder assessment of their real educational standard, while sitting the Ordinary Level exam does not mean what the results were etc. On the other hand at least a few may have been to International schools and done London Exams.

	Therefore it would be impossible to lump or equate educational standards. It is usual to use the names of manufacturers of the weighing /measuring instruments to authenticate the reliability. Under exclusion criteria, consanguinity should have been used. It would have been appropriate to compare data with National and Local Regional data from Sri Lanka or South East Asian data than WHO charts initially Page 10 1st sentence need not have 'development' The flow of the discussion and relevance could be improved.

REVIEWER	Bagkeris, Emmanouil University College London Competing interests: No competing interest
REVIEW RETURNED	11-Sep-2017

GENERAL COMMENTS	1. In the abstract and the main text, for the definition of the study population do not include the children that were excluded. Alternatively, state the number of children that were approached, then state number of children that were excluded (and briefly explain why at the methods section) and then conclude at the number of the final study population. 2. In the abstract, along with the medians of anthropometric characteristics, please provide interquartile ranges. 3. Please justify why medians of anthropometric measurements are used throughout the manuscript instead of z-scores. 4. Remove the p-values of the correlation coefficients from the abstract. They do not give enough information of the direction of the association. Instead report β-coefficients with 95% confidence intervals of univariable or multivariable linear regression models of the association of the anthropometric characteristics with maternal characteristics. Report the results also into tables in the main text. 5. In multivariable models consider simultaneous adjustment of all factors that are associated with the anthropometric measurements. 6. Please justify at the methods section, whether the mothers included were non-smokers during pregnancy or they were never smokers. 7. Please provide a column with p-values of the comparison between the calculated medians and WHO standard medians for all tables.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

1. In order to highlight that the "Sri Lanka problem" is an all-Indian problem, the authors might want to cite e.g. [Subramanyam MA, Ackerson LK, Subramanian SV. Patterning in birthweight in India: analysis of maternal recall and health card data. PLoS One 2010;5:e11424] and also comment on the

WHO Indian sub-sample. Also the WHO Indian sample is shorter and lighter.

Response 1- We read the suggested article and when mentioning the Low Birth Weight prevalence in India they have cited another reference (WHO, UNICEF). Therefore we too included that reference in page- 1, lines-14-15. Unfortunately, we could not find data regarding the WHO Indian sub sample.

2. The authors should also present weight (and BMI) of mothers both before pregnancy and the weight gain during pregnancy. This may be done as a table (or a scattergram).

Response 2- Thank you for the suggestion. However, data regarding the weight gain during pregnancy was not collected.

3. It is important to clearly show the lack of association between maternal educational level and child birth measures because the general notion still persists assuming that low birth weight and length are caused by poor maternal educational/health/nutritional circumstances.

Response 3- We have included the relevant p values for each parameter in both males and females which clearly show the lack of association between maternal education level and birth parameters in page- 7, lines- 24-27.

4. In view of the differences between WHO standards and the local reality, the authors should discuss possible solutions to this dilemma. Constructing national growth charts from large data sets are one possibility, but such charts are painstaking and costly. So-called synthetic growth references have alternatively been proposed [Hermanussen M, Stec K, Aßmann C, Meigen C, Van Buuren S. Synthetic growth reference charts. Am J Hum Biol. 2016 Jan 2;28(1):98-111].

Response 4- Thank you for pointing this out. We have discussed the alternative of using synthetic growth charts in our article in page- 11, lines- 12-16.

Reviewer: 2

1. In Sri Lanka previous studies show that birth weights differ with ethnicity , with the Moor (Muslim) community experiencing a higher birth weight nearing Caucasian standards. Would it be possible to categorize birth weights according to ethnicity ?

Response 1- We have categorized birth weights according to the ethnicities, Sinhala and Muslim and included it in the article in page-8, lines-9-14. We also analyzed ethnicity for possible associations with other anthropometric parameters however no such associations were found (page- 8, line- 14-15). Previous studies regarding this were also cited in the discussion (page- 10, lines- 5-8).

2. Earlier studies show birth parameters differing with parity, with a higher birth weight in the second pregnancy and again increasing after the fifth. Please recheck.

Response 2- Studies on the variation of birth parameters with parity have been included in our discussion (page- 9, lines- 20-28 and page-10, lines- 1-4). We rechecked our results but obtained a similar result.

3. Eliminate correlating IUGR with birth weight as many other factors are responsible for its patho-physiology.

Response 3- Thank you very much for pointing this out. We have addressed this in the article (page-

1, line-11 onwards).

Reviewer: 3
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1. Peradeniya/Kandy are small areas compared to Sri Lanka. The LBW rate in the Central Province (and some other areas) is high. The distribution of Ethnic groups could also vary. Therefore it is difficult to equate it to the rest of the country.

Response 1- Thank you for pointing this out. However though this hospital is in the Central Province it is located in the heart of the second largest city in Sri Lanka. Hence its drainage area consists of urban and rural populations(Page-3, lines-7-9). We do agree that more studies should be conducted island wide to obtain country specific standards (page- 11, lines- 10-11).

2. The mother's pre pregnancy weight would have been very inaccurate since many women especially in lower social strata would not weigh themselves regularly, the instruments used would vary a great extent. The weight may be taken at the maternity clinics in varying settings with varying facilities and accuracy at different times of pregnancy.

Response 2- We obtained the pre-pregnancy weight from the pregnancy card recorded at the booking visit (Before 12 weeks gestation) measured at the clinic conducted by the Medical Officer of Health or at a hospital. This information has been included in the article (page- 4, lines- 11-13).

3. The mothers height/childhood stunting could have been taken more accurately by the researchers that would have had a relevance. They may already have it although not used. The Birth Weight of mothers may also have been relevant although its accuracy also may also be unreliable.

Response 3- As correctly pointed out by Reviewer 3 the data was available to us which was analyzed and now included in the abstract and main article in page- 7, lines- 21-22.
Thank you very much for suggesting this.
Unfortunately we do not have the data regarding the birth weight of the mothers.

4. Since the mother's educational level has been used, the categorization is not clear. Many may go up to a particular class but automatic promotion may hinder assessment of their real educational standard, while sitting the Ordinary Level exam does not mean what the results were etc. On the other hand at least a few may have been to International schools and done London Exams. Therefore it would be impossible to lump or equate educational standards.

Response 4- The categories have now been made clear included in page- 4, lines- 13-14.

5. It is usual to use the names of manufacturers of the weighing /measuring instruments to authenticate the reliability.

Response 5- This has been addressed in the article (page-3, line- 24).

6. Under exclusion criteria, consanguinity should have been used.

Response 6- We agree with the comment however since we have excluded all congenital abnormalities the impact of this omission on the final results would have been minimal.

7. It would have been appropriate to compare data with National and Local Regional data from Sri Lanka or South East Asian data than WHO charts initially.

Response 7- This is a good suggestion however our objective was to compare our sample results with the WHO standards, as these are the standards that are used to assess the health status of a newborn in Sri Lanka.

8. Page 10 1st sentence need not have 'development'

Response 8- The amendment has been made in page-10, line- 12.

9. The flow of the discussion and relevance could be improved.

Response 9- The discussion has been revised and certain changes have been made to improve the flow and relevance.

Reviewer: 4

1. In the abstract and the main text, for the definition of the study population do not include the children that were excluded. Alternatively, state the number of children that were approached, then state number of children that were excluded (and briefly explain why at the methods section) and then conclude at the number of the final study population.

Response 1- This has been addressed in the abstract (lines- 9-11) and in the main text (page- 5, lines- 6-8).

2. In the abstract, along with the medians of anthropometric characteristics, please provide inter quartile ranges.

Response 2- The inter quartile ranges have been included in the abstract (lines- 12-13).

3. Please justify why medians of anthropometric measurements are used throughout the manuscript instead of z-scores.

Response 3- We have used a small sample of a standard population. Therefore we used the t test to compare the medians as z scores are usually used for standard populations.
Furthermore since WHO has provided a median, for comparisons sake we too calculated the median. Z scores were not used as further studies island wide would be needed to obtain z scores and formulate country specific standards.

4. Remove the p-values of the correlation coefficients from the abstract. They do not give enough information of the direction of the association. Instead report β-coefficients with 95% confidence intervals of univariable or multivariable linear regression models of the association of the anthropometric characteristics with maternal characteristics. Report the results also into tables in the main text.

Response 4- Thank you so much for suggesting this. It improved our article greatly. We have replaced the p value with the beta coefficients with 95% confidence interval in the abstract and summarized those results in tables in the main text.(page- 8, tables 5.3 and 5.4)

5. In multivariable models consider simultaneous adjustment of all factors that are associated with the anthropometric measurements.

Response 5- This was addressed by initially using the linear regression enter mode to identify significant and marginally significant variables. These were then entered into the step wise mode.

6. Please justify at the methods section, whether the mothers included were non-smokers during pregnancy or they were never smokers.

Response 6- The mothers included were never smokers and the necessary clarification has been made (page-4, line- 11)

7. Please provide a column with p-values of the comparison between the calculated medians and WHO standard medians for all tables.

Response 7- A column has been added with the relevant p values (page-6, tables 5.1 and 5.2)