



INFLUENCE OF LOW BIRTH WEIGHT ON CHILD MORTALITY IN LATIN AMERICA: LITERATURE REVIEW

INFLUÊNCIA DO BAIXO PESO AO NASCER NA MORTALIDADE INFANTIL NA AMÉRICA LATINA: REVISÃO DE LITERATURA

INFLUENCIA DEL BAJO PESO AL NACER EN LA MORTALIDAD INFANTIL EN LA AMÉRICA LATINA: REVISIÓN DE LITERATURA

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ABSTRACT

Objective: to determine the influence of low birth weight on child mortality in Latin America. **Method:** this is a systematic literature review with meta-analysis. The search for information was carried out in the databases PubMed, LILACS, SciELO, and the thesis bank of Capes, regardless of time, language, date, and mode of publication. The research question was: *What is the influence of low birth weight on child mortality, based on a literature review of studies carried out in Latin America?* The readings were performed by two independent reviewers. The instrument for methodological evaluation was the *Strengthening the reporting of observational studies in epidemiology statement* (STROBE). Cohort, case-control, and cross-sectional studies about the influence of low birth weight on child mortality in Latin America were included. Studies with methodological quality assessment (STROBE) with a grade C and those concerning perinatal mortality were excluded. **Results:** out of the 5 studies included, 3 indicated low birth weight as a significant factor of the influence on child mortality. **Conclusion:** the evidence obtained in this study suggest that low birth weight influence on child mortality. A lack of studies with judicious methodology was observed, hampering the assessment though meta-analysis. **Descriptors:** low birth weight; child mortality; systematic review; meta-analysis.

RESUMO

Objetivo: determinar a influência do baixo peso ao nascer na mortalidade infantil na América Latina. **Método:** trata-se de revisão sistemática de literatura com metanálise. A busca das informações se deu nas bases de dados PubMed, LILACS, SciELO e banco de tese da Capes, independente de tempo, idioma, data e forma de publicação. A questão de pesquisa foi: *Qual é a influência do baixo peso ao nascer na mortalidade infantil, com base em uma revisão de literatura de estudos realizados na América Latina?* As leituras foram realizadas por dois revisores independentes. O instrumento de avaliação metodológica foi o *Strengthening the reporting of observational studies in epidemiology statement* (STROBE). Foram incluídos estudos de coorte, de caso-controle e transversal sobre a influência do baixo peso ao nascer na mortalidade infantil na América Latina. Foram excluídos estudos com avaliação da qualidade metodológica (STROBE) com nota C e os que apresentaram mortalidade perinatal. **Resultados:** dos 5 estudos incluídos, 3 indicaram o baixo peso ao nascer como fator significativo da influência na mortalidade infantil. **Conclusão:** as evidências obtidas neste estudo sugerem que o baixo peso ao nascer influencia a mortalidade infantil. Observou-se uma escassez de trabalhos com metodologia criteriosa, dificultando a avaliação através da metanálise. **Descritores:** baixo peso ao nascer; mortalidade infantil; revisão sistemática; metanálise.

RESUMEN

Objetivo: determinar la influencia del bajo peso al nacer en la mortalidad infantil en la América Latina. **Método:** esta es una revisión sistemática de literatura con meta-análisis. La búsqueda de las informaciones tuvo lugar en las bases de datos PubMed, LILACS, SciELO y el banco de tesis de la Capes, independiente de tiempo, idioma, data y modalidad de publicación. La cuestión de investigación fue: *¿Cuál es la influencia del bajo peso al nacer en la mortalidad infantil, con base en una revisión de literatura de estudios realizados en la América Latina?* Las lecturas fueron realizadas por dos revisores independientes. El instrumento de evaluación metodológica fue el *Strengthening the reporting of observational studies in epidemiology statement* (STROBE). Fueron incluidos estudios de cohorte, de caso-control y transversales acerca de la influencia del bajo peso al nacer en la mortalidad infantil en la América Latina. Fueron excluidos estudios con evaluación de la calidad metodológica (STROBE) con grado C y los acerca de mortalidad perinatal. **Resultados:** de los 5 estudios incluidos, 3 indicaron el bajo peso al nacer como un factor significativo de la influencia en la mortalidad infantil. **Conclusión:** las evidencias obtenidas en este estudio sugieren que el bajo peso al nacer influencia la mortalidad infantil. Se observó una escasez de trabajos con metodología juiciosa, dificultando la evaluación a través del meta-análisis. **Descritores:** bajo peso al nacer; mortalidad infantil; revisión sistemática; meta-análisis.

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INTRODUCTION

Birth weight is an indicator appreciated in the evaluation of maternal and child health, as it reflects the quality of life of a community. Low birth weight is defined as a category of newborn infants weighing less than 2,500 g (up to and including 2,499 g).¹

An international document presents the overall incidences of low birth weight in Latin America, data ranging from 5% in Chile to 21% in Haiti, making an average of 10.35%, something which leads us to be very distant from the European Community, with 6.4%, and North America, with an average of 7.7% of low birth weight. Among the causes influencing on low birth weight indicated in this document are: low height women, who live in high-altitude locations, pregnant adolescents (under 18 years of age), lifestyle (alcohol, drugs), complications during pregnancy, and socioeconomic factors.² World values, presented in studies related to child mortality and birth weight vary significantly among countries and regions, are mentioned: from 7/1,000 (dead/live births) in Sweden to 96/1,000 in Burma, India, and Indonesia. In the city of Recife, Pernambuco, Brazil, the mortality was 91.2/1,000.³ Low birth weight has been indicated as a risk factor associated to child mortality, however, it doesn't appear alone, but combined to maternal socioeconomic factors.⁴

A research carried out in a large urban center in Brazil points out that low birth weight and maternal age under 20 years are risk factors for neonatal mortality. In turn, a study developed in the largest city of Rio Grande do Sul points out low birth weight associated to low maternal schooling in cases of increased child mortality. A recent study in a town in the state of Pernambuco shows a significant influence of low birth weight on child mortality.⁵⁻⁷ Three studies in major cities of the countryside of the states of Sao Paulo and Goias present similar data, which corroborate the works mentioned above, consisting of extreme maternal ages, low degree of maternal education, and low birth weight as factors for increased incidence of child mortality.⁸⁻¹⁰

In a retrospective study from the 1990s to 2002 the child mortality rates in Latin America presented significant rates. From 11/1,000 live births in Chile to 63/1,000 in Haiti, reflecting the social inequality among the countries in this continente.¹¹

In 2004, the Brazilian federal government created the National Pact for the Reduction of

Maternal and Neonatal Mortality, approved as a "portaria" on July 2005. One of the items displayed in this pact as influential in neonatal mortality (that occurring within 28 days after birth) is prenatal care (one recommends, at least, six visits). Other factors are present in the government document, which aims to implement measures aimed to solve the still high rate of child and neonatal mortality.¹²

Despite these efforts, Brazil has the third highest child mortality rate in South America (23/1,000), only after Bolivia (45/1,000) and Paraguay (32/1,000), according to data from the United Nations Population Fund (2008).¹³ Then comes a question: low birth weight in Latin America influences on child mortality?

As birth weight is a relevant indicator of newborn infants' health condition by the World Health Organization (WHO), as it reflects the life conditions of the individuals who conceived them, we consider important to carry out a systematic literature review with meta-analysis with regard to the several studies on low birth weight influencing on child mortality in Latin America. The purpose of this review is to determine the influence of low birth weight on child mortality in Latin America and we can provide data so that future researchers can find evidence on this important health indicator in the maternal and child health field with regard to our continent.

METHOD

This is a systematic literature review study with meta-analysis about studies which deal with the influence of low birth weight on child mortality in Latin America.

As a concept, "systematic literature review" consists in the use of systematic methods to identify, select, and critically appraise studies relevant to the topic chosen. We opted for this research method because it enables the gathering of results from several studies in a specific area, synthesizing their findings to draw conclusions with regard to the best evidence of each thematic area.^{14,15}

The guiding question of this research was: What is the influence of low birth weight on child mortality, based on a literature review of studies carried out in Latin America?

Prospective and retrospective cohort studies, case-control studies, and cross-sectional studies were included, regardless of language and mode of publication, and a scan was performed with regard to the date of publication. The participants were newborn infants with low birth weight. The primary

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conclusion was low birth weight and the secondary conclusion was child mortality. We excluded studies addressing perinatal mortality and the works assessing the methodological quality (STROBE) with a grade C.

Relevant studies were identified according to the following search strategy: thesis bank of Capes, SciELO, LILACS with the descriptor "low birth weight". PubMed database using the following keywords: low birth weight – *low-birth-weight infant* OR *infant, low-birth-weight* OR *infants, low-birth-weight* OR *low birth weight infant* OR *low-birth-weight infants* OR *low birth weight* OR *birth weight*,

low OR birth weights, low OR low birth weights; and mortality – mortality OR mortalities OR *case fatality rate* OR *case fatality rates* OR *age-specific death rate* OR *age-specific death rates* OR *death rate* OR *death rates* OR *mortality, excess* OR *excess mortality* OR *excess mortalities*.

We obtained complete photocopies of all relevant researches. The works were read to verify whether they met the inclusion criteria. Readings were performed by two independent reviewers (MS Professor Telma Regina Sanches Ranzani da Silva and Ph.D Professor Sonia Maria Oliveira de Barros), according to the topics of the form for data extraction.

Form for data extraction Date: ___/___/2008 Reviser: _____

| | |
|--|--|
| Identification (author, title, journal, year, volume, number, and page) | |
| Study | |
| 1. Type of study | |
| 2. Population | |
| 3. Sampling | |
| 4. Gaps in the excerpt | |
| Participants | |
| 1. Inclusion criteria | |
| 2. Exclusion criteria | |
| Conclusion measures | |
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| Location | |
| Financial support | |
| Observations (doubts, any incomplete information) | |

In case of doubt or disagreement, another reviewer was asked (Ph.D Professor Dulce Aparecida Barbosa) to issue her opinion. When there was more than one publication of the same study, we chose the newest one.

In order to assess methodological quality and provide criteria for inclusion and exclusion of studies, we used the recommendations from the *Strengthening the reporting of observational studies in epidemiology statement* (STROBE). The choice is due to the fact that this research worked only with observational studies, not experimental ones.¹⁶

Following the recommendations of STROBE, the works were read and classified into three categories: A (studies which met $\geq 80\%$ of the criteria), B (studies which met from 50% to 80% of the criteria), and C (studies which met $< 50\%$ of the criteria). The methodological quality assessment also constituted an exclusion criterion for studies with value C.

For statistical analysis we used the meta-

analysis, which is a statistical method applied to systematic review that integrates the results of two or more primary studies (clinical trials or observational studies).¹⁴ Despite systematic reviews primarily focus on randomized controlled trials, meta-analysis has been used to identify, evaluate, and synthesize works which adopt other research designs.¹⁵

The *Review Manager 5* was used as a tool for statistical analysis, it's available online. Due to the fact that this review presents cross-sectional studies and case-control studies, the dichotomous variables were addressed through the odds ratio (OR) measure, with confidence intervals of 95%.¹⁴

RESULTS

In the initial screening, 2,133 studies were found, and 2,069 didn't meet the inclusion criteria of this study. Out of the 64 selected studies, only 5 met the criteria for methodological evaluation (STROBE).

| Author | Location | Type of study | Sample | Primary conclusions | Secondary conclusions | STROBE | Primary outcomes |
|--|-------------------------------------|---------------|------------------------------------|-----------------------------|--|--------|--|
| Goulart et al. (2003) ¹⁶ | Belo Horizonte - MG Brazil | Case-control | 131 NB risk 88 NB control | Neo and postnatal death | - LBW - Non-educated mother - Adolescent mother - Breastfeeding - Maternal weight and height | A | - CM of NB LBW (RR = 68.81[16.22 - 300.41]) |
| Almeida et al. (1992) ¹⁷ | Ribeirao Preto - SP Brazil | Cohort | 6,750 LB | Neo and postnatal mortality | - LBW - Social class | A | CM in NB LBW among the proletariat (75.24%) |
| Silva et al. (2006) ¹⁸ | Maracanau - CE Brazil | Cohort | 11,127 LB | CM | - LBW - Premature - PNC ⁸ - Apgar 1 st and 5 th minutes | A | - CM in NB LBW (OR = 3.16) - Premature (OR = 2.70) - PNC < 6 (OR = 1.25) - Apgar 1 st minute (OR= 4.40) - Apgar 5 th minute (OR = 5.50) |
| Carvalho (2004) ¹⁹ | Recife - PE Brazil | Cohort | 25,686 LB | CM | - LBW - Premature - PNC - Apgar 1st and 5th minutes - Gestational age | A | - CM in NB LBW (RR = 24.54) - Apgar 5 th minute (RR = 28.45) - Premature (RR = 26.25) |
| Soares (2003) ²⁰ | Campos de Goitacazes - RJ Brazil | Cohort | 7,785 LB | CM | - LBW | A | - CM in NB LBW (RR = 4.04 - 9.50) |
| Abbreviations NB - Newborn LBW - Low birth weight CM - Child mortality RR - Relative risk LB - Live births PNC - Prenatal consultation OR - Odds ratio | | | | | | | |

Figure 1. Studies showing child mortality in low birth weight newborn infants.

Among the five studies included in Figure 1, all present significant relative risk or odds ratio with regard to the influence of low birth weight on child mortality. Other factors are presented, besides low birth weight, influencing on child mortality and prematurity, Apgar scores at the 1st and 5th minutes, six or less prenatal consultations,

and social class within proletariat; these factors didn't undergo meta-analysis due to the fact that they aren't focused on by the investigation of this research.

Figure 2 comprises a table and graph of the meta-analysis on the prevalence of child mortality in low birth weight newborn infants.

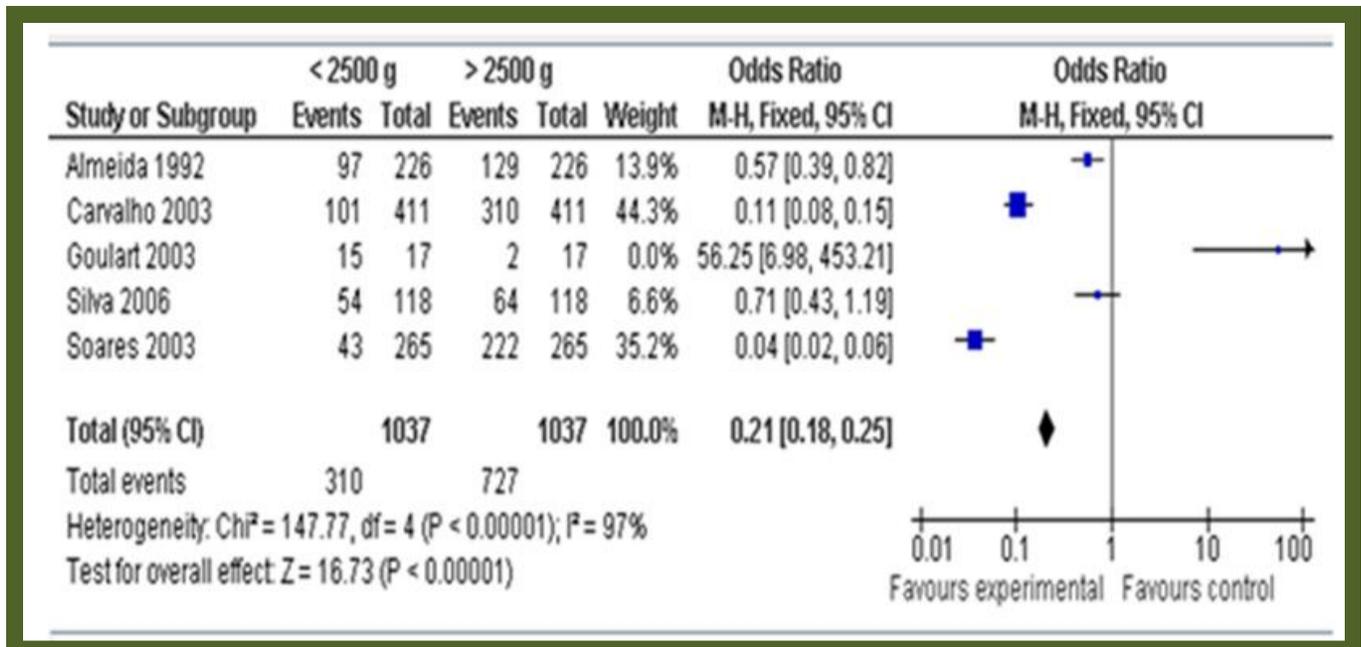


Figure 2. Odds ratio of child mortality in low birth weight newborn infants.

Out of the 5 studies listed in Figure 1, we observed that 3 presented a shift to the left from the zero point (1) of the graph, something which shows a fostering to the experimental group (< 2,500 g), which means an increase in child mortality of low birth weight newborn infants. A study touches the zero point of the graph (1), with no statistical difference concerning mortality between groups. Only one study presented a line ending with an arrow to the right of the zero point, indicating that the confidence interval extends beyond the scale of the graph, as it doesn't present a sufficient sample number. Heterogeneity was identified among the included studies ($I^2 = 97\%$, $p = 0.00001$). This heterogeneity may be explained by the difference found in the number of events, which ranged from 2 to 310 between the groups.

DISCUSSION

In studies establishing a relation between child mortality and low birth weight one observed a quite different oscillation, ranging from data regarded as ideal, as in Sweden (7/1,000 dead/live births), culminating in the painful results such as that of Burma, India, and Indonesia (up to 96/1,000 dead/live births). In Brazil, we have the city of Recife, where the mortality was 91.2/1,000. This same study highlights that as weight gets close to the appropriate weight range ($\geq 3,000$ g), the incidence of child mortality decreases.³

Some authors surveyed point out some factors associated to the influence of low birth weight on child mortality, such as extreme maternal ages and the low level of maternal education. However, all of them emphasize the variable low birth weight as a major factor in the incidence of child

mortality.⁵⁻¹⁰

We observed an increase in public policies in the field of maternal and child health in recent decades; we had 69.1% of child mortality in 1980 and there was a significant improvement in these indices, which reached 24.9% in 2006. However, Brazil still has the third highest child mortality rate in South America (23/1,000).^{12,13}

In our literature review, we found five studies pointing out low birth weight as a risk factor associated to child mortality after the application of meta-analysis. Even addressing a small number of papers methodically qualified, having in mind the large amount of papers screened, it seems relevant to us that the data found corroborate the authors mentioned above, who point out low birth weight as a relevant factor in the incidence of child mortality.

CONCLUSION

Out of the 5 studies about low birth weight influencing on child mortality included, only 3 showed to be significant, presenting an increase in child mortality in low birth weight newborn infants. We also observed other factors, besides low birth weight, influencing on child mortality, they are: prematurity, Apgar scores at the 1st and 5th minutes, six or less prenatal consultations, and class within proletariat, which didn't undergo meta-analysis due to the fact that they aren't focused on by the investigation of this research.

The evidence obtained in this study suggest that child mortality associated to low birth weight was significant, although the number of studies presented was small.

Despite the extensive systematic review research and the large number of studies

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found in the initial step, when the methodological assessment (STROBE) was applied, we observed a lack of works with universal and judicious methodology. The applicability of researches to public health requires us to be more careful in developing our projects and a better definition of research strategies recognized worldwide, as well as the non-use of regional methodologies hindering the assessment of studies in a systematic literature review.

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