

# A Study on Childhood Death at a Tertiary Care Level in Ernakulam District

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## Abstract

**Background:** Childhood mortality is increasing day by day. It will affect the development of the nation. Preventive measures on childhood mortality could be an effective approach for saving child's life. **Aim:** To find out the causes of deaths among children below 12 years of age those who were admitted in a teaching hospital during the period from April 2005 to March 2010. **Materials and Methods:** A retrospective study was conducted with hospitalized patients below 12 years those who died in a Teaching Hospital from April 1, 2005 to March 31, 2010. The data were collected from the registers maintained in the Medical Records Department. The data were analysed by using Microsoft Excel. Z test was applied for the comparison of proportions. *P* value less than or equal to 0.05 indicates that there is significance difference between the proportions of two groups. **Results:** Child deaths below 12 years of age during the period April 1, 2005 to March 31, 2010 were 459. Of these deaths 62.0% (285/459) of all child deaths were males and 37.9% (174/459) of all child deaths were females. Most of the deaths were in the neonatal period (deaths within 28 days of life). Most of the deaths occurred due to certain conditions originating in the perinatal period 52.2% (240/459) of all child deaths. Of the deaths occurred due to certain conditions originating in the perinatal period, 60% (144/240) of deaths were due to respiratory and cardiovascular disorders. **Conclusion:** Neonatal deaths were increasing each year. Conduct Health awareness programmes for reducing the neonatal deaths. And also improve the antenatal and newborn care for reducing the neonatal deaths.

**Keywords:** Asia, Childhood death, Infant, Mortality, Neonatal

## Introduction

Mortality data may be used in explaining trends and differentials in overall mortality, indicating priorities for health action and the allocation of resources, in designing intervention programmes and in the assessment and monitoring of public health problems and programmes. They also give important clues for epidemiological research. Worldwide mortality in children younger than 5 years has dropped from 11.9 million in 1990 to 7.7 million deaths in 2010, consisting of 3.1 million neonatal deaths, 2.3 million post neonatal deaths, and 2.3 million childhood deaths (deaths in children aged 1-4 years).

Of the deaths in children younger than 5 years of age, 33% of deaths occur in South Asia and 49.6% occur in sub-Saharan Africa, with less than 1% of deaths occurring in high-income countries. Across 21 regions of the world, rates of neonatal, post neonatal, and childhood mortality are declining. The global decline from 1990 to 2010 is 2.1% per year for neonatal mortality, 2.3% for post neonatal mortality, and 2.2% for childhood mortality.<sup>[1]</sup> Globally, there were 7.6 million deaths in children younger than 5 years in 2010. Between 2000 and 2010, the global burden of death in children younger than 5 years decreased by 2 million.<sup>[2]</sup> It is universally true that mortality in the first year of human life is high. In many countries, it is about 20 to 50 times higher than in the 10-15 years of age group. In all advanced countries, there has been a marked reduction in the infant mortality rate during recent years.<sup>[3]</sup>

A recently released annual report by the United nations international children's emergency fund (UNICEF) says that nearly 10 million children dying below the age of five every year, 2.1 million are Indians. Although child mortality

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rates have come down significantly in the last 15 years, two indicators have set alarm bells ringing; first, a very high count of the neonatal deaths.<sup>[4]</sup> Child mortality is strongly associated with economic factors.<sup>[5]</sup> Child mortality rate was much higher in rural India than in urban. Child mortality in rural India: 61 male children died per 1,000 male births and 71 female children died per 1,000 female births. Child mortality in urban India: Male deaths were 36 per 1,000 male births and females deaths was 40 per 1,000 female children. Deaths of female children was lowest in Kerala (16).<sup>[6]</sup> Child mortality per 1,000 live births in India for the years 2007, 2008, 2009, and 2010 are 52, 51, 50, and 48, respectively.<sup>[7]</sup>

Child mortality is a sensitive indicator of a country's development.<sup>[8]</sup> Every day, more than 26,000 children under the age of five died around the world, mostly from preventable causes.<sup>[9]</sup> Nearly all of them live in developing countries.<sup>[9]</sup> More than one-third of these children died during the first month of life, usually at home and without access to essential health services and basic commodities that might save their lives. Some of the children died due to respiratory or diarrheal infections that are no longer treated in industrialized countries or due to early childhood diseases that are easily prevented through vaccines. Nearly half of under five deaths occurred due to under nutrition, which derives a young child's body and mind of the nutrients needed for growth and development.<sup>[10]</sup>

Unsafe drinking water, poor sanitation and inadequate hygiene also lead to increase child mortality and morbidity.<sup>[10]</sup> The main objective of this study was to find out the cause of childhood death at a tertiary care level.

## Materials and Methods

This study was conducted in a Medical College hospital in the Ernakulam district of Kerala, India. It is a 5-year retrospective study. The study population was taken as the hospitalized deaths occurred in children below 12 years of age. Medical Records department is systematically abstracting and coding the causes of death as per International Classification of Diseases (ICD).<sup>[11]</sup> The permission was given by Medical Ethics Committee by submitting protocol for the same. This retrospective study was conducted among children below 12 years of age those who died in a Teaching Hospital during the period from April 1, 2005 to March 31, 2010. The data related to the study were collected from the registers maintained in the Medical records department. Data were analyzed by using Microsoft excel. Medical record department follows the guidelines of ICD-10 coding.<sup>[11]</sup>

### Technical information

Z test was applied for the comparison of proportions. *P* value less than or equal to 0.05 indicates that there is significance difference between the proportions of two groups. Microsoft excel was used for the analyzing the data. The data were collected according to the ICD-10 coding.

## Results

Total number of child deaths below 12 years of age during the period from April 1, 2005 to March 31, 2010 was 459. Of the deaths 67.7% (311/459) were infant deaths.

Neonatal deaths occurred in the study was 86.8% (270/311) of all infant deaths. Male deaths were more than female deaths. Neonatal death is defined as the number of deaths of children under 28 days of age in a year. Infant death is defined as the number of deaths of children under 1 year of age in a year as shown in Table 1.

Male deaths were more than female deaths. Of the 459 deaths, 58.8% (270/459) of all child deaths were in the neonatal period (deaths within 28 days of life). Most of the deaths were occurred in the neonatal period. 8.9% (41/459) of all child deaths were occurred in the post neonatal period (28 days to less than 1 year), 12.2% (56/459) of all child deaths were in the age group of 1 year to less than 5 years and 20.0% (92/459) of deaths were in the age group of 5 years to less than 12 years were shown in Chart 1.

No significant difference occurred in the proportion of neonatal deaths among the deaths of children in each time periods (*P* = 0.79). However, significant difference occurred in the proportion of neonatal deaths in the 1<sup>st</sup> and last time periods (*P* = 0.02). It indicates that proportion of neonatal deaths was significantly more in the last time period (April 1, 2009 to March 31, 2010) compared to the proportion of neonatal deaths in 4 years ago. Chart 2 showed that neonatal deaths are increasing in each year.

Patients who died after 72 hours from the time of admission in the hospital were 50.6% as shown in Table 2.

Child death occurred more due to the certain conditions originating in the perinatal period. Causes of death were mentioned in Table 3.

**Table 1: Details of deaths occurred among hospitalized children below 12 years of age in a tertiary care level from April 1, 2005 to March 31, 2010**

	Infant deaths	Neonatal deaths	Number of males	Number of females	Total number of deaths
Number	311	270	285	174	459
Percentage	67.76	58.82	62.09	37.91	

**Table 2: Distribution of duration of hospital stay of study population**

Duration of stay	No. of patients	Percentage
0-24 hours	120	26.1
24-48 hours	63	13.7
48-72 hours	44	9.6
>72 hours	232	50.6
Total	459	100

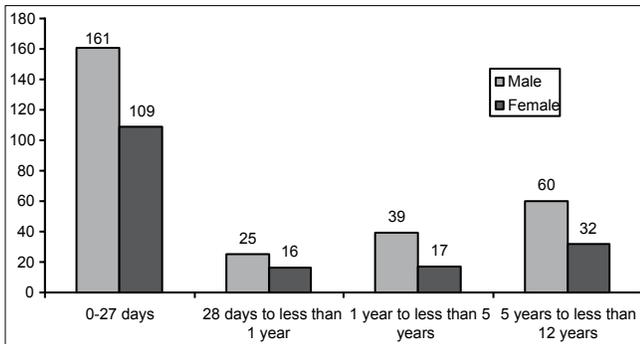


Chart 1: Age sex distribution of study population

Table 3: Distribution of causes of child deaths

Causes of death	No. of children	Percentage
Certain conditions originating in the perinatal period ( $P_{00}$ - $P_{96}$ )	240	52.3
Diseases of the genitourinary system ( $N_{00}$ - $N_{99}$ )	56	12.2
Congenital malformations, deformation ( $Q_{00}$ - $Q_{99}$ )	53	11.5
Diseases of the circulatory ( $I_{00}$ - $I_{99}$ )	37	8.0
Certain infectious and parasitic diseases ( $A_{00}$ - $B_{99}$ )	34	7.4
Injury, poisoning and certain other consequences of external causes ( $S_{00}$ - $T_{96}$ )	32	10.2
Diseases of the nervous system ( $G_{00}$ - $G_{99}$ )	22	4.8
Diseases of the respiratory system ( $J_{00}$ - $J_{99}$ )	17	3.7
Diseases of the digestive system ( $K_{00}$ - $K_{99}$ )	14	3.0
Endocrine, nutritional, and metabolic diseases ( $E_{00}$ - $E_{90}$ )	8	1.7
Neoplasms ( $C_{00}$ - $D_{48}$ )	7	1.5
Diseases of the blood and blood forming organs and certain disorders involving the immune mechanism ( $D_{50}$ - $D_{89}$ )	6	1.3
Others	34	7.4

In Table 3, the unit of analysis is cause of death, a child with multiple causes of deaths also may be counted. Therefore, the total of all causes of deaths is more than the total number of deaths.

Most of the deaths occurred due to certain conditions originating in the perinatal period. Of all child deaths occurred due to certain conditions originating in the perinatal period, 60% (144/240) occurred due to respiratory and cardiovascular disorders, 38.7% (93/240) occurred due to the disorders related to length of gestation and fetal growth, 25.8% (62/240) occurred due to bacterial sepsis, 7.1% (17/240) occurred due to birth asphyxia, 4.5% (11/240) occurred due to congenital pneumonia, 3.3% (8/240) occurred due to neonatal aspiration syndromes, 2.1% (5/240) occurred due to convulsions of newborn. 1.6% (4/240) occurred due to the diseases of fetus and newborn affected by maternal factors and complications

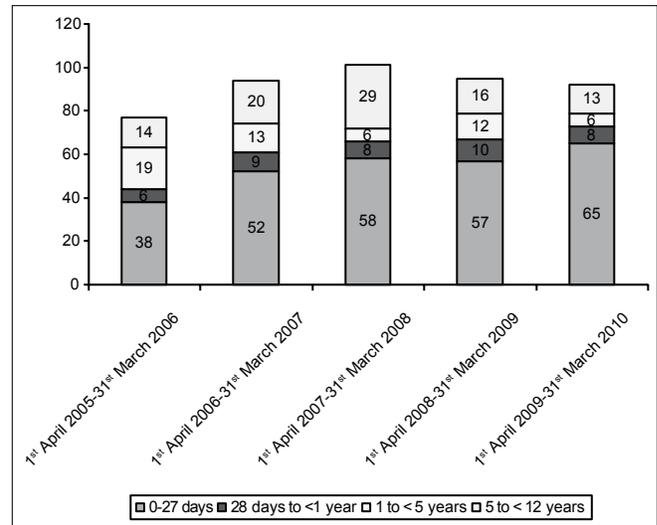


Chart 2: Age wise trend of study population from April 1, 2005 to March 31, 2010

of pregnancy, labor, and delivery. The unit of analysis is deaths occurred due to certain conditions originating in the perinatal period; a child death with more than one condition originating in the perinatal period also may be counted. Therefore, the total of all conditions originating in the perinatal period is more than the total number of deaths occurred due to certain conditions originating in the perinatal period.

Considering the all child deaths that occurred during the period from April 1, 2005 to March 31, 2010, 31.3% (144/459) all child deaths occurred due to the respiratory and cardiovascular disorders specific to the perinatal period. 20.2% (93/459) of all child deaths occurred due to the disorders related to length of gestation and fetal growth, 13.5% (62/459) of all child deaths occurred due to bacterial sepsis of newborn, 3.7% (17/459) of all child deaths occurred due to birth asphyxia, 2.4% (11/459) of all child death occurred due to congenital pneumonia, 1.7% (8/459) of all child deaths occurred due to neonatal aspiration syndromes, 1.1% (5/459) of all child deaths occurred due to convulsions of newborn. 0.8% (4/459) of all child deaths occurred due to the diseases of fetus and newborn affected by maternal factors and complications of pregnancy, labor, and delivery.

Of the neonatal deaths, 34.4% (93/270) of neonatal deaths occurred due to preterm birth.

3.7% (17/459) child deaths occurred due to the diseases of the respiratory system. 35.2% (6/17) of the deaths caused by the diseases of the respiratory system was due to influenza and pneumonia. Of the total child deaths, 1.3% (6/459) was due to influenza and pneumonia.

One of the important factors showed in the study was that there were no diarrhea deaths reported in the Medical College Hospital situated in the Ernakulam district of Kerala in India during the period from April 1, 2005 to March 31, 2010.

## Discussion

Child mortality is a sensitive indicator of a country's development and tells about the evidence of its priorities and values.<sup>[8]</sup> Childhood deaths have been reported in poor resource settings like poverty, ignorance and social instability have provided a platform on which malnutrition and infection – related diseases have resulted in childhood deaths.<sup>[12]</sup>

In developing countries, acute respiratory infection is a major cause of illness and death in children,<sup>[13]</sup> mainly in those below 1 year of age.<sup>[14,15]</sup> In the present study also, most of the child deaths occurred below 1 year of age.

A hospital-based study conducted in Kolkata mentioned that 42.9% of neonatal deaths occurred due to birth asphyxia.<sup>[16]</sup> Chowdhury, *et al.* conducted a study in Bangladesh and mentioned that 44.9% of neonatal deaths occurred due to birth asphyxia.<sup>[17]</sup> The present study's results also mentioned that 6.3% neonatal deaths occurred due to birth asphyxia. This difference may have occurred due to the poor antenatal care and care after birth.

Result of an Indian study mentioned that risk of death in children was highest in the neonatal period;<sup>[18]</sup> the same result was mentioned in another Indian study, it was 37.3%.<sup>[16]</sup> The present study also supports the same result.

In India, the main cause of deaths among children in the under five age group was due to neonatal causes (45%) during the years 2000-2003.<sup>[19]</sup> Similarly, in the present study, the main cause of deaths among children in the under five age group was due to neonatal causes (73.5%). Several studies have revealed that risk of death is comparatively higher during neonatal period and post neonatal period.<sup>[20]</sup> The present study also revealed that the risk of death was high in the neonatal period.

A study report mentioned that over 80% of deaths that occurred were in children under the age of five.<sup>[21]</sup> Another study reported that it was 80%.<sup>[22]</sup> This reflects the vulnerability of this age group. In the present study, 79.9% of deaths that occurred were in children under the age of five.

In India, pneumonia, one of the leading cause of death among children under 5 years of age, in the year 2000-2003 was 19%.<sup>[19]</sup> In the present study, 4.6% of deaths among the under five children was due to pneumonia including congenital pneumonia, influenza, and pneumonia. This study was conducted in a Medical College hospital in the Ernakulam district of Kerala in India during the period from April 1, 2005 to March 31, 2010. Globally, the main causes of neonatal deaths are thought to be pre term birth (28%).<sup>[10]</sup> In the South-East Asia Region, World Health Organization (WHO) has attributed 30% of neonatal deaths to pre term birth.<sup>[23]</sup> In the present study, 34.4% of neonatal deaths were due to pre term birth.

A study result mentioned that proportion of deaths due to respiratory infections was 23.1% of total deaths.<sup>[21]</sup> In the present study, 3.7% of deaths occurred due to the disease of respiratory system. In developing countries, acute respiratory infection is a major cause of illness and death in children.<sup>[13]</sup> In the present study, 31.3% of deaths occurred due to the respiratory and cardiovascular disorders specific to the perinatal period.

Two recent studies presented that global estimates of child deaths due to diarrhea were 2.5 million<sup>[24]</sup> and 2.1 million.<sup>[25]</sup> A review has estimated that 22% of all deaths among under-5s in sub-Saharan Africa and 23% in South Asia were caused by diarrheal diseases in the year 2000.<sup>[26]</sup> Diarrhea is one of the leading causes of death among the developing world's children, responsible for approximately two million deaths each year.<sup>[27]</sup> Global deaths from diarrhea of children aged less than 5 years were estimated at 1.87 million, approximately 19% of total child deaths. WHO African and South-East Asia Regions combined contain 78% (1.46 million) of all diarrhea deaths occurring among children in the developing world; 73% of these deaths are concentrated in just 15 developing countries.<sup>[28]</sup> In India, diarrhea was responsible for 13% of child deaths in India in 2010.<sup>[29]</sup> However, the end of the 20<sup>th</sup> century witnessed significant reductions in diarrhea deaths in children under five. Mortality rates due to diarrhea in children 1-59 months age among various states in India: These vary from 0.3 in Kerala to 17.8 per 1,000 live births in Bihar.<sup>[30]</sup> The present study showed that there was no diarrhea deaths reported in the hospital from April 1, 2005 to March 31, 2010. Deaths due to diarrhea were less in Kerala compared to other states in India. No diarrhea deaths were reported in the present study because this study may be conducted in a Medical College Hospital situated in Kerala.

A study report revealed that 55.4% of deaths occurred within 24 hours of admission, 13.9% of deaths were occurred between 24-48 hours of admission, and 30.53% of deaths occurred above 48 hours of admission.<sup>[16]</sup> But the present study revealed that 26.1% of deaths occurred within 24 hours of admission, 13.7% of deaths occurred between 24-48 hours of admission, and 60.2% of deaths occurred above 48 hours of admission.

The limitation of the present study is that it is a hospital-based retrospective study.

The present study mentioned that neonatal deaths were increasing in each year. It will affect the development of the nation. Health awareness programmes along with Medical care must be helpful for improving antenatal and newborn care for reducing neonatal deaths, especially in developing countries like India.

The results obtained from this study must be helpful for the health planners, administrators, and medical professionals to re-evaluate the existing services and in improving the facilities and patient care.

Special attention should be needed to the neonates and a study on the risk factors of neonatal deaths should also be needed for reducing the risk factors of neonatal deaths. Health awareness programs must be conducted in the community based on the risk factor of neonatal deaths. It will be helpful for avoiding or controlling the risk factors of neonatal deaths.

## References

- Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, *et al.* Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970-2010: A systematic analysis of progress towards Millennium Development Goal 4. *Lancet* 2010;375:1988-2008.
- Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, *et al.* Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. *Lancet* 2012;379:2151-61.
- Sundar Rao PSS, Richard J. Introduction to biostatistics and research methods: Google books, 4<sup>th</sup> edition, New Delhi 2006, p. 133. Available on [www.book-google.co.in/books?isbn=8120328760](http://www.book-google.co.in/books?isbn=8120328760).
- UNICEF. Child Mortality rate highest in India: IBNLIVE-HEALTH New Delhi, Health updated Jan 23, 2008.
- Zachariah KC, Patel S. Trends and determinants of infant and child mortality in Kerala. *Janasamkhyā* 1983;1:125-42.
- Kounteya Sinha, TNN. Child Mortality rate dips marginally in 2010. *The Times of India*, 31<sup>st</sup> March 2012.
- WHO: UNICEF, WORLD BANK, UN DESA, UNPD. Level and trends in child mortality. Report 2010, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. Available on [http://www.childmortality.org/files\\_V11/download/levels and trends in child mortality report 2010.pdf](http://www.childmortality.org/files_V11/download/levels_and_trends_in_child_mortality_report_2010.pdf).
- Park K. Indicators of health. In: Park K, editor. *Park's Textbook of Preventive and Social Medicine*. 17<sup>th</sup> ed. Jabalpur, India: M/S Banarsidas Bhanot Publishers; 2002. p. 21-4.
- Black RE, Morris SS, Bryce J. Where and why are 10 million children dying each year? *Lancet* 2003;361:2226-34.
- Bryce J, Boschi-Pinto C, Shibuya K, Black RE. WHO Child Health Epidemiology Reference Group. WHO estimates of the cause of death in children. *Lancet* 2005;365:1147-52.
- WHO. International statistical classification of diseases and related health problems, tenth revision (ICD-10). Geneva: World Health Organization, 1994. Available on <http://apps.who.int/classifications/icd10/browse/2010/en>.
- Lee JW. Child survival: A global health challenge. *Lancet* 2003;362:262.
- Chanock RM, Parrott RH. Acute respiratory disease in infancy and childhood: Present understanding and prospects of prevention. *Paediatrics* 1965;36:21-39.
- Glezen WP, Denny FW. Epidemiology of acute lower respiratory disease in children. *N Engl J Med* 1973;288:498-505.
- Orstavik I, Grandien M, Halonen P, Arstila P, Mordhorst CH, Hornsleth A, *et al.* Viral diagnoses using the rapid immunofluorescence technique and epidemiological implications of acute respiratory infections among children in different European countries. *Bull World Health Organ* 1984;62:307-13.
- Roy RN, Nandy S, Shrivastava P, Chakraborty A, Dasgupta M, Kundu TK. Mortality pattern of hospitalized children in a tertiary care hospital of Kolkata. *Indian J Community Med* 2008;33:187-9.
- Chowdhury HR, Thompson S, Ali M, Alam N, Yunus M, Streatfield PK. Causes of neonatal deaths in a rural subdistrict of Bangladesh: Implications for intervention. *J Health Popul Nutr* 2010;28:375-82.
- Ghosh S. Looking beyond the child. *Indian J Pediatr* 1988;55:879-81.
- WHO. Mortality country fact sheet 2006; World Health Statistics; 2006.
- Singhi S, Singhi S, Gupta G. Comparison of pediatric emergency patients in a tertiary care hospital vs a community hospital. *Indian Pediatr* 2004;41:67-72.
- George IO, Alex-Hart BA, Frank-Briggs AI. Mortality pattern in children: A hospital based study in Nigeria. *Int J Biomed Sci* 2009;5:369-72.
- Ojukwu JU, Ogbu CN, Nnebe-Agmadu UH. Post neonatal medical admissions into the paediatric wards of Ebony I state university teaching hospital, Abakaliki: The initial experiences and outcome. *Nig J Pediatr* 2004;31:79-86.
- Baqui AH, Darmstadt GL, Williams EK, Kumar V, Kurian TU, Panwar D, *et al.* Rates, timing and causes of neonatal deaths in rural India: Implications for neonatal health programmes. *Bulletin of the World Health Organization New York* 2006; 84:706.
- Kosek M, Bern C, Guerrant R. The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bull World Health Organ* 2003;81:197-204.
- Parashar UD, Hummelman EG, Bresee JS, Miller MA, Glass RI. Global illness and deaths caused by rotavirus disease in children. *Emerg Infect Dis* 2003;9:565-72.
- Morris SS, Black RE, Tomaskovic L. Predicting the distribution of under-five deaths by cause in countries without adequate vital registration systems. *Int J Epidemiol* 2003;32:1041-51.
- One World Health. Institute for World Health to compile comprehensive state of infectious Diarrhea Treatment's and potential solutions. Disease, Kills Millions of children in Developing countries. Path, San Francisco March 2004. Available on [www.oneworldhealth.org/press\\_releases/view/pr\\_1226362694](http://www.oneworldhealth.org/press_releases/view/pr_1226362694).
- Boschi-Pinto C, Velebit L, Shibuya K. Estimating child mortality due to diarrhoea in developing countries. *Bull World Health Organ* 2008;86:710.
- India Real time. Almost 5000 Indian Children die daily. *Wall Street Journal*, 2012.
- Million Death Study Collaborators, Bassani DG, Kumar R, Awasthi S, Morris SK, Paul VK, *et al.* Causes of neonatal and child mortality in India: A nationally representative mortality survey. *Lancet* 2010;376:1853-60.

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