



**UNIVERSITI PUTRA MALAYSIA**

***FACTORS ASSOCIATED WITH USAGE OF ORAL REHYDRATION  
SALTS FOR DIARRHEAL TREATMENT AMONG CHILDREN UNDER 5  
YEARS OLD IN SELATAN BALIKPAPAN, INDONESIA***

**TRI MURTI TUGIMAN**

**FPSK(M) 2016 26**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in  
fulfilment of the requirement for the degree of Master of Science

**FACTORS ASSOCIATED WITH USAGE OF ORAL REHYDRATION SALTS  
FOR DIARRHEAL TREATMENT AMONG CHILDREN UNDER 5 YEARS OLD  
IN SELATAN BALIKPAPAN, INDONESIA**

By

**TRI MURTI TUGIMAN**

**May 2016**

**Chairmen : Associate Professor Muhamad Hanafiah Juni., MD, MPH.**

**Faculty : Medicine and Health Science**

Diarrheal disease is one of the leading causes for death among children under 5 years old. Oral Rehydration Salts (ORS) have contributed to a substantial reduction in death among infants due to diarrhea. The levels and the factors affecting the usage of ORS had been unknown in Balikpapan Selatan, Indonesia.

A cross-sectional study was to determine the usage of ORS in the treatment of diarrhea among children under 5 years old and its associated factors mothers attending health clinics and study become important consideration for health workers in developing program to increase mothers awareness practice diarrhea treatment. The study was conducted at health clinics in Balikpapan Selatan Indonesia. Stratified random sampling was employed to select the respondents among the mothers attending health clinics. The data were collected from 1st May 2012 to 1st August 2012 (3 months). All respondents were interviewed face-to-face using pre-tested questionnaire. The questionnaire consisted of demographic information, knowledge about diarrhea, belief, perception, health service factors, and costs factors. As for analysis of data, chi-square test and logistic regression analysis in SPSS 22.0 were used, whereas the level of significance for all statistics was set at  $p < 0.05$ .

The response rate for this study was 90%. Significant associations had been discovered between usage of ORS and age of children ( $P=0.002$ ), birth order ( $P<0.001$ ), current marital status ( $P=0.026$ ), highest education level ( $P=0.013$ ), occupation ( $P=0.001$ ), knowledge on diarrhea ( $P=0.008$ ), belief among mothers ( $P<0.001$ ), perception of mothers ( $P<0.001$ ), as well as health service factors ( $P<0.001$ ). The logistic regression analysis revealed that the factors associated with usage of ORS were age of mothers (Adj, OR=4.657; 95% CI: 1.42, 15.26); marital status (Adj, OR=16.55; 95%CI:4.21, 65.06); level of education (Adj, OR=3.017; 95%CI: 1.26, 9.18); occupation (Adj, OR=3.399; 95%CI: 1.26, 9.18); knowledge on diarrhea among mothers (Adj, OR=33.23; 95%CI: 13.56, 81.45); belief among mothers (Adj, OR=16.00 %CI: 5.27, 48.63); as well as perception of mothers (Adj, OR=19.12%; 95%CI: 2.67, 136.83).

In conclusion, factors related to mothers, such as age, marital status, level of education, occupation, knowledge, belief, perception, and health service factors, as well as sources and modes of obtaining ORS had been found the usage of ORS solution among children under 5 years old suffering from diarrhea in Balikpapan Selatan Indonesia.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**FAKTOR-FAKTOR YANG BERKAITAN DENGAN PENGGUNAAN GARAM REHIDRASI ORAL UNTUK PENGURUSAN CIRIT-BIRIT DI KALANGAN KANAK-KANAK BAWAH 5 TAHUN DI BALIKPAPAN SELATAN INDONESIA**

Oleh

**TRI MURTI TUGIMAN**

**Mei 2016**

**Pengerusi : Professor Madya Muhamad Hanafiah Juni., MD. MPH**

**Fakulti : Perubatan dan Sains Kesehatan**

Penyakit cirit-birit merupakan salah satu punca kematian di kalangan kanak-kanak di bawah umur 5 tahun. Garam Rehidrasi Oral (ORS) mengurangkan kematian dalam jumlah yang besar dikalangan kanak-kanak akibat cirit-birit. Tahap dan faktor yang memberi kesan kepada penggunaan ORS tidak dikenali dalam Balikpapan Selatan, Indonesia.

Satu kajian keratan rentas adalah untuk menentukan penggunaan ORS dalam rawatan cirit-birit di kalangan kanak-kanak di bawah umur 5 tahun dan faktor di kalangan ibu-ibu yang menghadiri klinik kesihatan dan belajar menjadi pertimbangan yang penting untuk pekerja kesihatan dalam membangunkan program untuk meningkatkan amalan ibu dalam kesedaran merawat cirit-birit. Kajian ini telah dijalankan di klinik-klinik kesihatan di Balikpapan Selatan Indonesia. Persampelan rawak melapis telah digunakan untuk memilih responden di antara ibu-ibu yang melawat ke klinik kesihatan. Data yang telah dikumpulkan dari 1 Mei 2012 hingga 1 Ogos 2012 (3 bulan). Semua responden ditemu duga secara berdepan menggunakan soalan yang telah disimak. Soal selidik ini terdiri daripada maklumat demografi, pengetahuan mengenai cirit-birit, kepercayaan, persepsi, faktor perkhidmatan kesihatan dan kos faktor. Bagi analisis data, uji khi-kuadrat dan analisis regresi logistik dalam SPSS 22.0 telah digunakan, manakala tahap kepentingan bagi semua statistik telah ditetapkan pada  $p < 0.05$  untuk analisis data.

Kadar tindak balas bagi kajian ini adalah 90%. Terdapat hubungan yang signifikan di antara penggunaan garam rehidrasi oral dan umur kanak-kanak ( $P = 0.002$ ), susunan kelahiran ( $P < 0.001$ ), status perkahwinan semasa ( $P = 0.026$ ), tahap pendidikan tertinggi ( $P = 0.013$ ), pekerjaan ( $P = 0.001$ ), pengetahuan mengenai cirit-birit ( $P = 0.008$ ), kepercayaan agama di kalangan ibu-ibu ( $P < 0.001$ ), persepsi ibu ( $P < 0.001$ ), serta faktor-faktor perkhidmatan kesihatan ( $P < 0.001$ ). Analisis regresi logistik menunjukkan bahawa faktor-faktor yang berkaitan dengan penggunaan garam rehidrasi oral adalah umur ibu (Adj, OR = 4,657; 95% CI: 1.42, 15.26); status perkahwinan (Adj, OR = 16.55; 95% CI: 4.21, 65,06); tahap pendidikan (Adj, OR = 3,017; 95% CI: 1.26, 9.18); pekerjaan (Adj, OR = 3,399; 95% CI: 1.26, 9.18); pengetahuan ibu berkenaan cirit-birit (Adj, OR = 33,23; 95% CI: 13.56, 81,45); kepercayaan ibu (Adj, OR = 16.00% CI: 5.27, 48,63); dan persepsi ibu (Adj, OR = 19.12%; 95% CI: 2.67, 136,83).

Kesimpulannya, faktor yang berkaitan dengan iibu, seperti umur, status perkahwinan, tahap pendidikan, pekerjaan, pengetahuan, kepercayaan, persepsi, dan faktor perkhidmatan kesihatan, serta sumber-sumber dan cara mendapatkan garam rehidrasi oral meningkatkan penggunaan garam rehidrasi oral dengan ketara di kalangan kanak-kanak di bawah umur 5 tahun dengan cirit-birit di Balikpapan Selatan Indonesia.

## ACKNOWLEDGEMENTS

Alhamdulillahrabbi'lalamiin. Thanks to Allah s.w.t for giving me all the courage and competence to complete this level.

I would like to express my deep sense of gratitude to my supervisor, Professor. Dr. Muhamad Hanafiah Juni, who always supported and provided me with guidance conducting the research and being fully understanding during the process and completion of this study. I wish to thank all my committee members; Prof. Dr. Hejar bt Abdul Rahman and Dr. Salmiah bt. Md Said. I sincerely appreciate them for spending innumerable hours in reading the draft and suggesting improvement on my thesis.

I am grateful to Scholarship Kaltim Cemerlang for sponsoring the whole period of my study at Universiti Putra Malaysia. Special thanks are extended to staffs of the Department of Community Health Authority for their friendly cooperation during the process of survey.

Special thanks are extended to my beloved husband, Fahmi Nasrullah for his great support at all times. My parents, alm. Mr. Tugiman and Mrs. Salamah. I appreciate the concern of my daughter Khansa Hanifa Az-Zahra and Syarah Qila Fadhilatunnisa, and my sisters for their endless love, prayers and encouragement. Sincere thanks to my friends, especially to Uni Renny, Indah, Riri, Gita, Emput, Mba lili, Zuy, Maya, Sari, and Nurul, for their valuable assistance and moral support in order to complete my postgraduate study.

I certify that a Thesis Examination Committee has met on 20 May 2016 to conduct the final examination of Tri Murti Tugiman on her thesis entitled "Factors Associated With Usage of Oral Rehydration Salts For Diarrheal Treatment Among Children Under 5 Years Old In Selatan Balikpapan, Indonesia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

**Ahmad Azuhairi Ariffin, PhD**

Lecturer  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Chairman)

**Faisal bin Ibrahim, PhD**

Associate Professor  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Internal Examiner)

**Wan Mohd Zahiruddin bin Wan Mohammad, PhD**

Associate Professor  
School of Medical Sciences  
Universiti Sains Malaysia  
(External Examiner)

---

**ZULKARNAIN ZAINAL, PhD**

Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 26 July 2016

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Muhamad Hanafiah Juni., MD, MPH**

Associate Professor  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Chairman)

**Hejar Abdul Rahman., MD, MPH**

Associate Professor  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Member)

**Salmiah Md Said., MD, MPH**

Senior Lecturer  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Member)

---

**BUJANG BIN KIM HUAT, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:



## Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name and Matric No.: Tri Murti Tugiman (GS31966)

## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: \_\_\_\_\_

Name of Chairman of  
Supervisory  
Committee:

Muhamad Hanafiah Juni., MD, MPH  
\_\_\_\_\_

Signature: \_\_\_\_\_

Name of Member of  
Supervisory  
Committee:

Hejar Abdul Rahman., MD, MPH  
\_\_\_\_\_

Signature: \_\_\_\_\_

Name of Member of  
Supervisory  
Committee:

Salmiah Md Said., MD, MPH  
\_\_\_\_\_

## TABLE OF CONTENTS

	Page
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	v
<b>APPROVAL</b>	vi
<b>DECLARATION</b>	viii
<b>LIST OF TABLES</b>	x
<b>LIST OF FIGURES</b>	
<b>LIST OF ABBREVIATIONS</b>	
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	
1.1 Introduction to the chapter	1
1.2 Background	1
1.3 Problem statement	3
1.4 Significance of study	3
1.5 Research question	3
1.6 Research objectives	4
1.6.1 General objective	4
1.6.2 Specific objective	4
1.7 Research hypothesis	5
<b>2 LITERATURE REVIEW</b>	
2.1 Introduction to the chapter	6
2.2 The epidemiology of children under 5 years in diarrhea	6
2.3 Guideline for policy in controlling diarrhea and implementation of policy for usage of ORS in Indonesia	9
2.4 Rationale for usage of oral rehydration salts in the management of diarrhea	11
2.5 Review of factors associated with usage of oral rehydration salts for management of diarrhea among children under 5 years old	13
2.5.1 Socio demographic factors of children	13
2.5.1.1 Age	1
2.5.1.2 Gender	14
2.5.1.3 Birth order	14
2.5.1.4 Number of children in household	15
2.5.2 Socio demographic factors of mothers	15
2.5.2.1 Age	15

	2.5.2.2	Ethnic group	16
	2.5.2.3	Religion	16
	2.5.2.4	Marital status	16
	2.5.2.5	Education level	16
	2.5.2.6	Occupation	17
	2.5.2.7	Family income	17
	2.5.3	Knowledge	18
	2.5.4	Belief	20
	2.5.5	Perception	21
	2.5.6	Health services factors	21
	2.5.7	Traditional treatment for diarrhea	22
	2.5.8	Conceptual framework	23
<b>3</b>	<b>METHODOLOGY</b>		
	3.1	Introduction to the chapter	25
	3.2	Study location	25
	3.3	Study design	27
	3.4	Study duration	27
	3.4.1	Study population	27
	3.4.2	Sampling frame	27
	3.4.3	Sampling unit	27
	3.4.4	Sampling size	27
	3.4.5	Sampling technique	28
	3.4.6	Inclusion and exclusion criteria	28
	3.5	Data collection	28
	3.5.1	Instrument	28
	3.6	Variable	30
	3.6.1	Dependent variable	30
	3.6.2	Independent variable	30
	3.7	Quality control	31
	3.7.1	Validity of the questionnaire	32
	3.7.2	Reliability of the questionnaire	32
	3.8	Data analysis	32
	3.9	Ethical issues	33
	3.10	Operational definition	33
	3.10.1	Practices with usage of ORS	33
	3.10.2	Age	33
	3.10.3	Gender	33
	3.10.4	Birth order	34
	3.10.5	Number of children in a household	34
	3.10.6	Ethnic	34
	3.10.7	Religion	34
	3.10.8	Marital status	34
	3.10.9	Level of education	34
	3.10.10	Occupation	35

3.10.11	Family income	35
3.10.12	Area health clinic	35
3.10.13	Knowledge on danger signs of diarrhea	35
3.10.14	Knowledge on the causes of diarrhea	35
3.10.15	Diarrhea as a serious childhood illness	35
3.10.16	Timeliness of seeking care	36
3.10.17	Availability of ORS in the house	36
3.10.18	Knowledge on mixing ORS	36
3.10.19	Knowledge on frequency of ORS	36
3.10.20	Knowledge on quantity of ORS	36
3.10.21	Knowledge on storage of prepared ORS	37
3.10.22	Causes of diarrhea	37
3.10.23	Belief that diarrhea is a mild illness	37
3.10.24	Belief of mothers who took their children for treatment	37
3.10.25	Before the children were give ORS, should they be injected first?	37
3.10.26	Mother's belief on the treatment of diarrhea after the diarrhea episodes had been more than thrice a day	38
3.10.27	Perception on the usage of ORS	38
3.10.28	Distance to source of ORS	38
3.10.29	The time required to receive the treatment of diarrhea with ORS	38
3.10.30	Waiting time in the health facilities	39
3.10.31	Reception at health facility	39
3.10.32	Health education provider on diarrhea	39
3.10.33	Availability of health provider at time of visit	39
3.10.34	Health workers receiving visit at the facility	39
3.10.35	Did mothers have to buy ORS	40

	3.10.36	Mothers pay for ORS	40
	3.10.37	Mothers pay for health facilities	40
<b>4</b>	<b>RESULTS</b>		
	4.1	Introduction to the chapter	41
	4.2	Response rate	41
	4.3	Normality data	41
	4.4	Socio demographic characteristics of children	42
	4.5	Socio economic characteristics of mothers	43
	4.6	The prevalence of ORS usage for children under 5 years	45
	4.7	Other practices of mothers regarding treatment of diarrhea for children under 5 years old	46
	4.8	Responses by mothers pertaining to usage of ORS	47
	4.9	Complications of diarrhea among children under 5 years old	48
	4.10	Knowledge of mothers on children under 5 years old with diarrhea	49
	4.11	Belief of mothers on the usage of ORS	51
	4.12	Perception of mothers on the usage of ORS	52
	4.13	Health service factors of usage ORS	53
	4.14	Cost of usage of ORS	54
	4.15	The relationship between socio demographic characteristics of children and the usage of ORS	55
	4.16	The relationship between socioeconomic characteristics of mothers and the usage of ORS	57
	4.17	The association between mothers knowledge and usage of ORS	59
	4.18	Association between mothers belief and usage of ORS	60
	4.19	The association between mothers perception and usage of ORS	61
	4.20	The associated between mothers health services factors and usage of ORS	62
	4.21	Predictor for the usage of ORS by mothers for management of diarrhea among children under 5 years old	63
<b>5</b>	<b>DISCUSSION</b>		
	5.1	Oral rehydration salts (ORS) solution	65
	5.2	Usage of ORS solution and socio demographic characteristics of children	66
	5.2.1	Usage of ORS solution and age	66
	5.2.2	Usage of ORS solution and birth order	66
	5.2.3	Usage of ORS solution and gender	66
	5.2.4	Usage of ORS solution and the number of children in household	67
	5.3	Usage of ORS solution and socio economic characteristics of mothers	68

5.3.1	Usage of ORS solution and age	68
5.3.2	Usage of ORS solution and religion	68
5.3.3	Usage of ORS solution and marital status	68
5.3.4	Usage of ORS solution and level education	68
5.3.5	Usage of ORS solution and occupation	69
5.3.6	Usage of ORS solution and family income	69
5.4	Usage of ORS solution and mothers knowledge	69
5.5	Usage of ORS solution and mothers belief	70
5.6	Usage of ORS solution and health services factors	70
<b>6</b>	<b>CONCLUSION</b>	
6.1	Summary and conclusion	72
6.2	Limitations of the study	72
6.3	Recommendation based on the findings	72
6.4	Recommendation for future studies	73
	<b>REFERENCES</b>	74
	<b>APPENDICES</b>	89
	<b>BIODATA OF STUDENT</b>	104

## LIST OF TABLES

<b>Table</b>	<b>Page</b>	
2.1	Diarrhea in children (within 2 weeks)	7
2.2	Family practice in treating diarrhea among children under 5 years	8
2.3	Composition of ORS (CH <sub>2</sub> O) <sub>n</sub>	12
3.1	List all causes diarrheal in District Balikpapan	25
3.2	List all clinics in Balikpapan Selatan, East Kalimantan	26
4.1	Distribution of socio demographic characteristics of children	43
4.2	Distribution of socio economics characteristics of mothers	44
4.3	Distribution knowledge mothers in children diarrhea under five years old	49
4.4	Distribution knowledge mothers of usage ORS	50
4.5	Distribution belief mothers of usage ORS	51
4.6	Distribution perception mothers of usage ORS	52
4.7	Distribution health service factors of usage ORS	53
4.8	Distribution cost in usage ORS	54
4.9	Relationship between socio demographic characteristics children with usage ORS	56
4.10	Relationship between socio economics characteristics mothers with usage ORS	58
4.11	Associated between mother's all knowledge and usage of ORS	59
4.12	Associated between mother's belief and usage of ORS	60
4.13	Association between mother's perception and usage of ORS	61
4.14	Association between mother's health service and	62



usage of ORS

- 4.15** Predictor of usage ORS by mothers for management diarrhea among under five years old children

64



## LIST OF FIGURES

Table		Page
2.1	Factors associated ORS usage for diarrhea treatment among children under 5 years	24
3.1	Map Balikpapan Selatan, Indonesia	26
4.1	Normal PP Plot of Regression Standardized Residual	42
4.2	Distribution of Usage Oral Rehydration Salts Solution for Children Under 5 Years (N = 403)	45
4.3	Distribution of Mothers Regarding Management of Diarrhea Among Under 5 Years old Children	46
4.4	Distribution of Respond by Mothers Usage Oral Rehydration Salts Solution (N = 403)	47
4.5	Distribution of Contamination of Diarrhea among Children Under Five Years Old (N = 403)	48

## LIST OF ABBREVIATIONS

adj. OR	Adjusted Odds Ratio
BHS	Basic Health Research
CDD	Control of Diarrheal Disease
CHERG	Child Health Epidemiology Reference Group
CI	Confidence Interval
DGAP	Diarrhea Global Action Plan
EDHS	Eritrea Demographic and Health Survey
ICC	Intra-class Correlation Coefficient
IDHS	Indonesia Demographic and health Survey
IDR	Indonesian Rupiah Rate
IMR	Infant Mortality Rate
IVAS	International Vaccine Access Centre
MCH	Maternal and Child Health
MDG	Millennium Development Goal
NFHS	National Family Health Survey
ORS	Oral Rehydration Salts
ORT	Oral Rehydration Therapy
SPSS	Statistical Package for Social Scientists
UNICEF	United Nations Children's Fund
WHO	World Health Organization

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction to the chapter

This chapter presents the research background for the study that had been carried out, including the problem statement, the research questions, the research objectives, and finally, the research hypotheses.

### 1.2 Background

Mach *et al.* (2009) and Walker *et al.* (2012) stated that diarrhea is a disease characterized by having watery stool more than thrice a day with liquid feces consistency sign. The most important indicator of diarrhea in children is the consistency of stools. Passing more than thrice with well-formed stool is not considered as diarrhea, as well as babies fed only with breast milk, who often pass loose stools (World Health Organization (WHO), 2005).

Diarrhea occurs due to gastrointestinal infections caused by parasitic organisms, viruses, and bacteria. These are normally caused by poor personal hygiene, such as person to person or drinking water, or contaminated food (Asif *et al.*, 2013).

The World Health Organization (2013) has classified acute diarrheal episodes in children as mild, moderate, and severe diarrhea. Mild acute diarrhea is defined as having a few diarrhea stools in a day, whereas moderate acute diarrhea is defined as having more than a few but not more than 10 diarrhea stools in a day. Meanwhile, severe acute diarrhea is defined as having more than 10 times loose and watery stools in a single day (24 hours). Unfortunately, it had been estimated that more than 588 million moderate and severe episodes of diarrhea occurred among children in developing countries, resulting in some form of dehydration (Lamberti *et al.*, 2011).

Diarrhea is a common cause of death among children, accounting for 9 per cent of all deaths among children under age of 5 worldwide. In 2013, an estimate of 1,600 children died each day, or about 580,000 a year due to diarrhea. Most deaths from diarrhea occur among children less than 2 years of age living in South Asia and sub-Saharan Africa (WHO & UNICEF, 2013). Despite this heavy toll, slow progress was made in preventing death due to diarrhea among children. From 2000 to 2013, the annual total number of deaths from diarrhea among children under 5 decreased from over 1.2 million to fewer than 0.6 million. This was because many children were saved through

appropriate and simple management of diarrhea in children with the use of oral rehydration salts (ORS) and zinc supplementation (UNICEF, 2012).

Furthermore, UNICEF and the WHO have recommended the treatment of diarrhea in children by replacing fluids through oral rehydration therapy. These interventions have been proven to be cost-effective, affordable, and relatively straightforward to be implemented (WHO & UNICEF, 2004). However, at worldwide, only 40 per cent of children under the age of 5 with diarrhea received oral rehydration therapy for treatment of diarrhea. Coverage of ORS usage was the lowest in sub-Saharan Africa and South Asia Regions (36 per cent and 38 per cent, respectively), where most deaths from diarrhea occurred among children (UNICEF, 2014a).

Besides, diarrhea is an endemic in Indonesia and it is also a potential disease outbreak, often accompanied by death. Based on a report prepared by the Indonesian Ministry of Health pertaining to a survey carried out in 2007, diarrhea had been the number one cause of death among children under 5 years old (25.2%), and in year 2013, it cause 6.7% of death among children under 5 years old (Indonesian Ministry of Health, 2014). Although there was a decrease in the incidence of diarrhea, it had been discovered that the use ORS for treatment of diarrhea among children was low (33.3%) (Indonesian Ministry of Health, 2013).

In fact, many factors can be associated to the causes of diarrhea in Indonesia. Hardi (2012) found that diarrhea had been related to maternal knowledge, exclusive breastfeeding, and environment sanitation. Meanwhile, Adisasmito (2007) systematically reviewed the factors of diarrhea in infants, as well as children in Indonesia, and suggested that environmental factors, such as clean water and toilets, led to the incidence of diarrhea in children.

It is important to make provision against diarrhea by increasing knowledge and awareness among mothers about proper management and practice of children suffering from diarrhea. One of the methods is known as Oral Rehydration Salts (ORS), which has become the most commonly recommended treatment for dehydration caused by diarrhea. Moreover, many researchers have proven the effectiveness of ORS in dealing with diarrhea among children (Munos *et al.*, 2010; Pham *et al.*, 2013; Walker *et al.*, 2013; Walker & Walker, 2014). In addition, numerous researches also have portrayed that one of the main causes of death among infants had been diarrhea, which was attributed to improper health management, either at home or in the health care (Das *et al.*, 2014; Lanata *et al.*, 2013). Diarrheal episodes in children under 5 years old, which are not treated appropriately, can lead to severe dehydration, as well as contribute to high morbidity and mortality rates. In Balikpapan Selatan, the children under 5 years old was 5/1,000 live births compared to the national average of 32/1,000 live births with diarrhea (Indonesian Ministry of Health, 2010a).

### **1.3 Problem Statement**

The Indonesia Demographic and Health Survey (IDHS, 2007), as well as the Basic Health Research (BHS, 2007) found that the prevalence of diarrhea that led to death for 0 - 11 month was 16.5%. Besides, the Indonesian Ministry of Health (2007) reported that 16.77% of under 5 years old died due to diarrhea. Even though reduction was observed in the incidence of diarrhea among children from 2007 to 2013, it was still a major cause of death among children under 5 years old, whereas the prevalence of diarrhea among 12 - 23 months old infants in rural Balikpapan Selatan, Indonesia was 5.7% (Indonesian Ministry of Health, 2013).

Other than that, it had been revealed that the ORS solution used in children under 5 years old with diarrhea in Balikpapan Selatan is low. Of the 14,127 children under 5 years of age who were reported to suffer from diarrhea, only 5792 (41%) received ORS solution compared to the national target of 80% (Indonesian Ministry of Health, 2013).

ORS had been widely known as the most efficient solution to combat diarrhea in children, especially in developing countries, where the health facilities are faced with many limitations. In Balikpapan, similar to other areas in Indonesia, the ORS is available for free to help decrease the number of diarrhea cases. Unfortunately, the use of ORS in Balikpapan is still very low, while the rate of incidence for diarrhea is still quite high. Therefore, this research looked into the factors related to the usage of ORS in Balikpapan.

### **1.4 Significance of study**

Even though several influential factors associated to mothers concerning diarrhea management practices had been identified, none had referred to Balikpapan in Indonesia. Hence, it is very important to study this issue in Balikpapan due to the multiethnic society that represents the various cultures among them. This study also intended to understand the different factors that could possibly affect their practice in diarrhea management. The results obtained from this study would be useful for health workers in Balikpapan in developing a program to increase the awareness among mothers concerning practice in diarrhea management.

### **1.5 Research Questions**

Several research questions developed in this study are listed in the following:

- i) What is the practice of mothers regarding ORS in the diarrhea management among children under 5 years old in Balikpapan?
- ii) What are the factors associated with ORS practices among

- mothers in diarrhea management?
- iii) What are the relationships between ORS practices among mothers in diarrhea management of children and their socio-demographic, knowledge, belief, perception, as well as health service factors?
  - iv) What are the common factors of ORS usage for management of diarrhea among children under 5 years old?

## **1.6 Research Objectives**

The objectives of this study are organized in two parts, namely general objectives and specific objectives, as depicted in the following:

### **1.6.1 General Objective**

To determine the usage of ORS in the treatment of diarrhea among children under 5 years old and its associated factors among mothers attending health clinics in Balikpapan Selatan.

### **1.6.2 Specific Objectives**

The specific objectives of the study are listed in the following:

- i) To determine the socio demographic, practices, knowledge, belief, perception, and health services factors concerning the usage of ORS in treatment of diarrhea among mothers.
- ii) To determine the usage of ORS among mothers for treatment of diarrhea in children under 5 years old.
- iii) To determine the associations between mothers practices in usage of ORS for treatment of diarrhea among children under 5 years old and:
  - age of children
  - sex of children
  - birth order of children
- iv) To determine the associations between mothers practices in usage of ORS for treatment of diarrhea among children under 5 years old and:
  - socio economic characteristic of mothers
  - socio demographic characteristic of children
  - knowledge of mothers regarding diarrhea
  - knowledge of mothers regarding ORS
  - belief of mothers on treatment of diarrhea
  - perception of mothers on ORS
  - health service factors
- v) To determine the predictors for the usage of ORS for management of diarrhea among children less than 5 years old.

## 1.7 Research Hypotheses

Based on the hypotheses, several hypotheses were developed in this study. The hypotheses are depicted in the following:

- H1: There is a significant association between children socio-demographic factors with mothers' practices using ORS.
- H2: There is a significant association between mothers and socio-demographic factors with mothers' practices using ORS.
- H3: There is a significant association between knowledge on diarrhea and mothers' practices using ORS.
- H4: There is a significant association between mothers knowledge on ORS and mothers' practices using ORS.
- H5: There is a significant association between mothers belief on treatment of diarrhea and mothers' practices using ORS.
- H6: There is a significant association between perceptions and mothers' practices using ORS.
- H7: There is a significant association between health services factors and mothers' practices using ORS.



## REFERENCES

- Adhikari, K.P., Kunwar, L.S., MacDonald, V. Paudel, M. 2006. Qualitative research for a Zinc treatment program in Nepal: Findings and recommendations.  
[http:// www.psp-one.com/content/resource/detail/3280/](http://www.psp-one.com/content/resource/detail/3280/).
- Adimora, G.N., Ikefuna, A.N. and Ilechukwu, G. 2011. Home management of childhood diarrhoea: Need to intensify campaign. *Nigerian Journal of Clinical Practice* 14(2): 237-241.
- Adisasmito, W., 2007. Risk factors of diarrhea in infants and children in Indonesia: Systematic review of public health academic research. *Makara Kesehatan* 11(1): 1-10.
- Adroque, H.J and Madias, N.E. 2000. Hyponatremia. *New England Journal of Medicine* 342(20): 1493-1499.
- Ahmed, I.S., Eltom, A.R., Karrar, Z.A. and Gibril, A.R. 1994. Knowledge, attitude and practices of mothers regarding diarrhoea among children in a Sudanese rural community. *East Africa Medical Journal* 71(11):716-9.
- Ali, M., Atkinson, D. and Underwood, P. 2000. Determinants of use rate of oral rehydration therapy for management of childhood diarrhoea in rural Bangladesh. *Journal Health Population and Nutrition* 18(2): 103-108.
- Amare, D., Dereje, B., Kassle, B., Tessema, M., Mulu, G., Alene, B. and Ayele, A. 2014. Maternal knowledge and practice towards diarrhoea management in under 5 children in Fenote Selam Town, West Gojjam Zone, Amhara Regional State, Northwest Ethiopia. *Journal Infectious Disease and Therapy* 2:6.
- Ansari, M., Ibrahim, M.I.M., Hassali, M.A., Shankar, P.R., Koirala, A. and Thapa, N.J. 2012. Mothers' belief and barriers about childhood diarrhea and its management in Morang district, Nepal. *BMC Research Notes* 5: 576.
- Ansari, M., Ibrahim, M.I.M. and Shankar, P.R. 2011. A survey of mothers' knowledge about childhood diarrhea and its management among marginalised community of Morang, Nepal. *Australasian Medical Journal* 4(9): 474-479.
- Ansari, M., Palaian, S. and Ibrahim, M.I.M. 2009. The role of mothers in the management of childhood diarrhoea in Nepal. *Australasian Medical Journal* 1(14): 235-238.
- Asif, M., Tripathi, N.K., Ahmed, S. 2013. Toward near real time public health surveillance (A decision support system for public health surveillance). *International Journal of Computer Applications* 61(21): 0975-8887.

- Arvelo, W., Degollado, J., Reyes, L. and Alvarez, A. 2013. Perception regarding oral rehydration solution for the management of diarrhea in Guatemalan children: implications for diarrheal management in the Americas. *Pan American Journal of Public Health* 34(2): 121-126.
- Arvelo, W., Kim, A., Creek, T., Legwaila, K., Puhr, N., Johnston, S., Masunge, J., Davis, M., Mintz, E. and Bowen, A. 2010. Case-control study to determine risk factors for diarrhea among children during a large outbreak in a country with a high prevalence of HIV infection. *International Journal of Infectious Disease* 14(11): 1002-1007.
- Arvelo W, Padilla N, Henao O, Jordan H, Pez-zarossi N, and Reyes L. 2007. Community house-hold survey to describe healthcare utilization practices and risk factors for diarrheal diseases in the department of Santa Rosa, Guatemala 2006. In: Proceedings of the forty-fifth annual meeting of the Infectious Diseases Society of America; San Diego: IDSA; 2007.
- Basic Health Research (BHS). 2007. Indonesia Basic Health Research 2007-2008. Ministry of Health Indonesia.
- Berisha, M., Gashi-Hoxha, S., Gashi, M. and Ramadani, N. 2009. Maternal practice on management of acute diarrhea among children under 5 years old in Kosova. *TAF Preventive Medicine Bulletin* 8(5): 369-372.
- Berlin, E.A. and Berlin, B. 2002. Medical ethnobiology of the highland maya of Chiapas, Mexico: The gastrointestinal disease, pp 21-35. New York: Princeton University Press.
- Black, R.E., Coursens, S., Johnson, H.L., Lawn, J.E., Rudan, I., Bassani, D.G., Jha, P., Campbell, H., Walker, C.F., Cibulskis, R., Eisele, T., Liu, L., Mathers, C. and for the Child health epidemiology Reference Group of WHO and Unicef. 2010. *Lancet* 375:1969-87.
- Blanchord, H. 2003. A multi – site qualitative case comparison study of health utilization among Ugandans participating in health care micro – insurance. *Research Report*. Kampala: Uganda.
- Blum, L.S., Oria, P.A., Olson, C.K., Breiman, R.F. and Ram, P.K. 2011. Examining the use of oral rehydration salts and other oral rehydration therapy childhood diarrhea in Kenya. *American Journal Tropical Medicine and Hygiene* 85(6): 1126-1133.
- Caruso, B., Stephenson, R., and Leon, J.S. 2010. Maternal behavior and experience, care access, and agency as determinants of child diarrhea in Bolivia. *Rev Panam Salud Publica* 28(6): 429-439.
- Charyeva, Z., Cannon, M., Oguntunde, O., Garba, A.M., Sambisa, W., Bassi, A.P., Ibrahim, M.A., Danladi, S.E. and Lawal, N. 2015. Reducing the burden of diarrhea among children under 5 years old: lessons learned from oral rehydration therapy corner program implementation in Northern Nigeria. *Journal of Health Population and Nutrition* 34: 4.

- Claeson, M.H.M.M. 1990. Global progress in the control of diarrheal diseases. *Paediatric Infectious Disease Journal* 9: 345-55.
- Das, J.L., Salam, R.A. and Bhutta, Z.A. 2014. Global burden of childhood diarrhea and interventions. *Current Opinion in Infectious Disease* 27(5):451-458.
- Derby, K.S., Lucien, M.A.B., Leshem, E., Steenland, M.W., Juin, S., Joseph, G.A. and Katz, M.A. 2014. Short report: Hospitalizations and death caused by diarrhea in children 5 years old and younger at four hospitals in Haiti, 2010-2012. *The American Society of Tropical Medicine and Hygiene* 90(2): 291-293.
- Desjeux, D., Favre, I., Simongiovanni, J., varge, L., Cailol, M.H., and Taponnier, S. 1996. Why is oral therapy associated with drugs in the treatment diarrhea?. *Journal Paediatric Gastroenterology Nutrition* 22: 112-4.
- Dinas Kesehatan Kalimantan Timur. 2012. Profil Kesehatan.
- Dinas Kesehatan Balikpapan. 2013. Profil Kesehatan.
- Diouf, K., Tabatabai, P., Rudolph, J. and Marx, M. 2014. Diarrhoea prevalence in children under 5 years of age in rural Burundi: an assessment of social and behavioural factors at the household level. *Global Health Action* 7: 24895.
- Ene-Obong, H.N., Iroegbu, C.U. and Uwaegbute, A.C. 2000. Perceived causes and management of diarrhoea in young children by market women in Enugu State, Nigeria.
- Fontaine, O., Gore, S.M. and Pierce, N.F 2000. Rice-based oral rehydration solution for treating diarrhea. *Cochrane Database Systematic Review* 2: 1264.
- Gao, W., Yan, H., Wang, D. and Dang, S. 2013. Oral rehydration salt use and its correlates in low-level care of diarrhea among children under 36 months old in rural Western China. *BMC Public Health* 13:238.
- Gauci, C., Gilles, H., Brien'O, S., Mamo, J., Stabile, I., Ruggeri, F.M., Gatt, A., Calleja, N. and Spiteri, G. 2007. The magnitude and distribution of infectious intestinal disease in Malta: A population-based study. *Epidemiol Infect* 135: 1282-1289.
- Genser, B., Strina, A., Santos, L. A.D., Teles, C.A., Prado, M.S., Caircross, S. and Barreto, M.L. 2008. Impact of city-wide sanitation intervention in large urban centre on social, environmental and behavioral determinants of childhood diarrhoea: analysis of two cohort studies. *International Journal of Epidemiology* 37: 831-840.

- Ghasemi, A.A., Talebin, A., Alavi, N.M. Mousavi, G.A. 2013. Knowledge of mothers in management of diarrhea in under-5 children, in Kashan, Iran. *Nursing and Midwifery Studies* 2(1): 158-62.
- Glewwe, P. 1999. Why does mother's schooling raise child health in developing countries? Evidence from Morocco. *The Journal of Human Resources* 34(1): 124-159.
- Goldman, N., Pebley, A.R. and Gragnolati, M. 2002. Choices about treatment for ARI and diarrhea in rural Guatemala. *Social Science Medical* 55(10): 1693-712.
- Guandalini, S. 2000. Treatment of acute diarrhea in the new millennium. *Journal Pediatric Gastroenterology Nutrition* 30(5): 486-9.
- Guerrant, R.L., Gilder, T.V., Steiner, T.S., Thelman, N.M., Slutsker, L., Tauxe, R.V., Hennessy, T., Griffin, P.M., DuPont, H., Sack, R.B., Tarr, P., Neill, M., Nachamkin, I., Reller, L.B., Osterholm, M.T., Bennis, M.L. and Pickering, L.K. 2001. Practice guidelines for the management of infectious diarrhea. *Clinical Infectious Disease* 32(1): 331-351.
- Gurpreet, K., Tee, G.H., Amal, N.M., Parameswarthy, R. and Karuthan, C., 2011. Incidence and determinants of acute diarrhoea in Malaysia: A population-based study. *Journal Health Population and Nutrition* 29(2): 103-112.
- Hahn, S., Kim, Y., and Garner, P. 2001. Reduced osmolarity oral rehydration solution for treating dehydration due to diarrhea in children: Systematic review. *BMJ* 323: 81-85.
- Hair, J., J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. 2006. *Multivariate data analysis* (6th ed) Upper Saddle River. Pearson Prentice Hall : New York.
- Hall, G.V., Kirk, M.D., Ashbolt, R., Stafford, R. and Lalor, K. Frequency of infectious gastrointestinal illness in Australia, 2002: Regional, seasonal and demographic variation. *Epidemiol Infect* 134: 111-8.
- Hardi, R.A. 2012. The factors which are the incident of diarrhea at toddler in local Clinic Baranglombo Ujung Tanah Subdistrict. Bachelor Thesis, Universitas Hasanudin.
- Herikstad, H., Yang, S., Gilder-Van, T.J., Vugia, D., Hadler, J., Blake, P., Deneen, V., Shiferaw, B., Angulo, F.J., and the FoodNet working group. 2002. A population-based estimate of the burden of diarrhoeal illness in the United States: FoodNet, 1996-7. *Epidemiol Infect* 129: 9-17.
- Imhoff, B., Morsen, D., Shiferaw, B., Hawkins, M., Vugia, D., Parker-Lance, S., Hadler, J., Medus, C., Kennedy, M., Moore, M.R., Gilder, T.V. and for the Emerging Infections Program FoodNet Working Group. 2004. Burden of self-reported acute diarrheal illness in foodnet surveillance areas, 1998-1999. *Clinical Infectious Disease* 38(3): 219-26.

- Indonesia Demographic and Health Survey (IDHS). 2007. Demographic and Health Survey Reports. Childhood disease 158-168. Ministry of Health Indonesia.
- Indonesia Ministry of Health. 2000. *Buku pedoman P2 diare*. Jakarta.
- Indonesia Ministry of Health. 2010a. Indonesia Health Profile. Jakarta.
- Indonesia Ministry of Health. 2010b. Panduan sosialisasi tatalaksana diare balita. Direktorat Jenderal P2PL: Jakarta.
- Indonesia Ministry of Health. 2012. *Kajian morbiditas diare 2012*. Jakarta.
- Indonesia Ministry of Health. 2013. Indonesia Health Profile. Jakarta.
- Indonesia Ministry of Health. 2014. Indonesia Health Profile Summary. Jakarta.
- International Vaccine Access Center (IVAC). 2014. Pneumonia and diarrhea progress report 2014. Baltimore : Johns Hopkins Bloomberg School of Public Health.
- Jamison, D.T., Breman, J.G., Measham, A.R., Alleyne, G., Claeson, M., Evans, D.B., Jha, P., Mills, A. Musgrove, P. 2006. Priorities in developing countries (2<sup>nd</sup> edition). In: *Diarrheal Disease*, ed. Keusch, G.T., Fontaine, O., Bhargava, A., Pinto-Boschi, C., Bhutta, Z.A., Gotuzzo, E., Rivera, J.A., Chow, J., Salles-Shahid, S.A. and Laxminarayan, R, pp. 371-388. Oxford University Press and World Bank : Washington DC.
- Jones, T.F., McMillian, M.B., Scallan, E., Frenzen, P.D., Cronquist, A.B., Thomas, S. and Angulo, F.J. 2007. A population-based estimated of the sustantial burden of diarrheal disease in teh United States; FoodNet, 1996-2003. *Epidemiol Infect* 135: 293-301.
- Jones, T.F. and Grimm, K. Public knowledge and belief about diarrheal disease. *Foodborne Pathogen Disease* 8(1):165-7.
- Kaatano, G.M., Muro, M.I.S. and Medard, M. 2006. Caretaker's perception, attitude and practices regarding childhood febrile illness and diarrhoeal disease among riparian communities of Lake Victoria, Tanzania. *Tanzania Health Research Bulletin* 8(3): 155-61.
- Kaguna-Amooti, B. and Nuwaha, F. 2000. Factors influencing choice of delivery sites in Rakai district of Uganda. *Social Science and Medicine* 50: 203-213.
- Katende and Charles. 1994. The impact of access to health services on infant and child mortality in Rural Uganda. *Journal African Population Studies* 9: 1.
- Kermani, N.A., Jafari, F., Mojarad, H.N., Hoseinkhan, N. and Zali, R. 2010. Prevalence and associated factors of persistent diarrhoea in Iranian

- children admitted to a paediatric hospital. *East Mediterr Health Journal* 16(8): 831-836.
- Khalili, M., Mirshahi, M., Zarghami, A., Rajabni, M. and Farahmand, F. 2013. Maternal knowledge and practice regarding childhood diarrhea and diet in Zahedan, Iran. *Health Scope* 2(1): 19-24.
- Kiguli, J., Kiracho-Ekirapa, E., Okui, O., Mutebi, A., MacGregor, H. and Pariyo, G.W. 2009. Increasing access to quality health care for the poor: Community perceptions on quality care in Uganda. *Journal of Patient Preference and Adherence* 3: 77-85.
- King, J.C., Black, R.E., Doyle, M.P., Fritsche, K.L., Halbrook, B.H., Levander, O.A., Meydani, S.N., Walker, A. and Woteki, C.E. 2000. Foodborne illnesses and nutritional status: A statement from an American society for nutritional science working group. *Journal of Nutrition* 130: 2613-2617.
- Kolahi, A.A., Nabavi, M. and Sohrabi, M.R. Epidemiology of acute diarrheal disease among children under 5 years of age in Tehran, Iran. *Iranian Journal of Clinical Infectious Disease* 3(4): 193-198.
- Kolahi, A.A. and Shekarriz, R. 2008. Maternal knowledge and practice in toward oral rehydration therapy in acute diarrheal in less than 5 years old children is southern of Tehran. *Journal Tropical Infect Disease* 44(14):45-50.
- Kosek, M., Bern, C. Guerrant, R.L. 2003. The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bulletin of The World Health Organization* 81:3.
- Kudlova, E., 2010. Home management of acute diarrhoea in Czech children. *Journal of Paediatric Gastroenterology and Nutrition* 50(5): 510-515.
- Kudlova, E. and Rames, J. 2007. Food consumption and feeding pattern of Czech infants and toddlers. *European Journal of Clinical Nutrition* 61: 239-247.
- Kuusi, M., Aavitsland, P., Gondrosen, B. and Kapperud, G. 2003. Incidence of gastroenteritis in Norway - population-based survey. *Epidemiol Infect* 131: 591-597.
- Lamberti, L.M., Walker, C.L.F., Noiman, A., Victora, C. and Black, R.E. 2011. Breastfeeding and the risk for diarrhea morbidity and mortality. *BMC Public Health* 11 (3): 515.
- Lanata, C.F., Walker-Fischer, C.L., Olascoaga, A.C., Torres, C.X., Aryee, M.J., Black, R.E. and For the Child Health Epidemiology Reference Group on the World Health Organization. 2013. Global causes of diarrheal disease mortality in children <5 years of age: A systematic review. *PLoS One* 8:9.
- Landis, J.R. and Koch, G.G. 1977. The measurement of observer agreement for categorical data. *Biometrics* 33(1): 159-74.

- Larson, C.P., Saha, U.R., Islam, R. Roy, N. 2006. Childhood diarrhoea management practices in Bangladesh: private sector dominance and continued inequities in care. *International Journal of Epidemiology* 35: 1430-1439.
- Lemeshow, S., Hosmer, J.R.D.W., Klar, J. and Lwanga, S.K. 1990. Adequacy of sample size in health study. *World Health Organization*
- Lenters, L.M., Das, J.K. and Bhutta, Z.A. 2013. Systematic review of strategies to increase use of oral rehydration solution at household level. *BMC Public Health* 13(3): 528.
- Leung, A. and Prince, T. 2006. Oral rehydration therapy and early refeeding in the management of childhood gastroenteritis. *Nutrition and Gastroenterology Committee, Canadian Paediatric Society* 11(8): 527-31.
- LeVina, R.A., Dexter, E., Velasco, P., LeVine, S., Joshi, A.R., Stuebing, K.W. and Uribe-Tapia, F.M. 1994. Maternal literacy and health care in three countries: A preliminary report. *Health Transition Review* 4(2): 186-191.
- Liu, L., Johnson, H.L., Cousen, S., Perin, J., Scott, S., Lawn, J.E., Rudan, I., Campbell, H., Cibulskis, R., Li, M., Mathers, C., Black, R.E. 2012. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet* 379 (9832): 2151-2161.
- Liu, L., Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J.E., Cousens, S., Mathers, C., and Black, R.E. 2015. Global, region, and national causes of child mortality in 2000-13, with projections to inform post-2015 priorities: An updated systematic analysis. *Lancet* 385(9966): 430-440.
- Lozano, R., Naghavi, M., Foreman, K., Lim, S., Shiguya, K., Aboyans, V., Abraham, J., Adair, T., Aggarwal, R., Ahn, S.Y., Alvarado, M., Anderson, H.R., Anderson, L.M., Andrews, K.G., Atkinson, C., Baddour, L.M., Barker-Collo, S., Bartels, D.H., Bell, M.L., Benjamin, E.J., Bennett, D., Bhalla, K., Bikbov, B., Bin-Abdulhak, A., Birbeck, G., Blyth, F., Bolliger, I., Boufous, S., Bucello, C., Burch, M., Burney, P., Carapetis, J., Chen, H., Chou, D., Chugh, S.S., Coffeng, L.E., Colan, S.D., Colquhoun, S., Colson, K.E., Condon, J., Connor, M.D., Cooper, L.T., Corriere M, Cortinovis M, de Vacarro KC, Couser W, Cowie, B.C., Criqui, M.H., Cross, M., Dabhadkar, K.C., Dahodwala, N., De-Leo, D., Degenhardt L, Delossantos A, Denenberg J, Des-Jarlais, D.C., Dharmaratne SD, Dorsey ER, Driscoll T, Duber, H., Ebel, B., Erwin, P.J., Espindola, P., Ezzati, M., Feigin, V., Flaxman, A.D., Forouzanfar, M.H, Fowkes, F.G., Franklin, R., Fransen, M., Freeman, M.K., Gabriel, S.E., Gakidou, E., Gaspari, F., Gillum, R.F., Gonzalez-Medina, D., Halasa, Y.A., Haring, D., Harrison, J.E., Havmoeller, R., Hay, R.J., Hoen, B., Hotez, P.J., Hoy, D., Jacobsen, K.H., James, S.L., Jasrasaria, R., Jayaraman, S., Johns, N., Karthikeyan, G., Kassebaum, N., Keren, A., Khoo, J.P., Knowlton, L.M., Kobusingye, O., Koranteng, A., Krishnamurthi, R., Lipnick, M., Lipshultz, S.E., Ohno, S.L., Mabweijano, J., MacIntyre, M.F., Mallinger, L., March,

L., Marks, G.B., Marks, R., Matsumori, A., Matzopoulos, R., Mayosi, B.M., McAnulty, J.H., McDermott, M.M., McGrath, J., Mensah, G.A., Merriman, T.R., Michaud, C., Miller, M., Miller, T.R., Mock, C., Mocumbi, A.O., Mokdad, A.A., Moran, A., Mulholland, K., Nair, M.N., Naldi, L., Narayan, K.M., Nasser, K., Norman, P., O'Donnell, M., Omer, S.B., Ortblad, K., Osborne, R., Ozgediz, D., Pahari, B., Pandian, J.D., Rivero, A.P., Padilla, R.P., Perez-Ruiz, F., Perico, N., Phillips, D., Pierce, K., Pope, C.A., Porrini, E., Pourmalek, F., Raju, M., Ranganathan, D., Rehm, J.T., Rein, D.B., Remuzzi, G., Rivara, F.P., Roberts, T., De-Leo'n, F.R., Rosenfeld, L.C., Rushton, L., Sacco, R.L., Salomon, J.A., Sampson, U., Sanman E, Schwebel DC, Segui-Gomez M, Shepard, D.S., Singh, D., Singleton, J., Sliwa, K., Smith, E., Steer, A., Taylor, J.A., Thomas, B., Tleyjeh, I.M., Towbin, J.A., Truelsen, T., Undurraga, E.A., Venketasubramanian, N., Vijayakumar, L., Vos, T., Wagner, G.R., Wang, M., Wang, W., Watt, K., Weinstock, M.A., Weintraub, R., Wilkinson, J.D., Woolf, A.D., Wulf, S., Yeh, P.H., Yip, P., Zabetian, A., Zheng, Z.J., Lopez, A.D., Murray, C.J., AlMazroa, M.A. and Memish, Z.A. 2012. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 380: 2095–2128.

- MacDonald, S.E., Moralejo, D.G. and Matthews, M.K. 2007. Maternal understanding of diarrhoea-related dehydration and its influence on ORS use in Indonesia. *Asia Pacific Journal of Public Health* 19 (1): 34-39.
- Mach, O., Lu, L., Creek, T., Bowen, A., Arvelo, W., Smit, M., Masunge, J., Brennan, M. and Handzel, T. 2009. Population-based study of a widespread outbreak of diarrhea associated with increased mortality and malnutrition in Botswana January-March 2006. *The American Journal of Tropical Medicine and Hygiene* 80 (5): 812-818.
- Majowicz, S.E., Dore, K., Flint, J.A., Edge, V.L., Read, S., Buffett, M.C., McEwen, S., McNab, W.B., Stacey, D., Sockett, P., and Wilson, J.B. 2004. Magnitude and distribution of acute, self-reported gastrointestinal illness in a Canadian community. *Epidemiol Infect* 132: 6007-617.
- Majowicz, S.E., Horrocks, J. and Bocking, K. 2007. Demographic determinants of acute gastrointestinal illness in Canada: a population study. *BMC Public Health* 7: 162.
- McLennan, J.D. 2002. Home management of childhood diarrhea in poor peri urban community in Dominican Republic. *Journal Health Population and Nutrition* 20(3): 245-54.
- Mediratta, R.P., Feleke, A., Moulton, L.H., Yifru, S. and Sack, R.B. 2010. Risk factors and case management of acute diarrhoea in North Gondar Zone, Ethiopia. *Journal Health Population and Nutrition* 28(3): 253-263.
- Melo-de, M.C.N., Taddei, J.A.A.C., Santoz-Diniz, D.R., Vieira, C., Carneiro, N.B., Melo, R.F. and Silva, L.R. 2008. Incidence of diarrhea in children



living in urban slums in salvador, Brazil. *Brazilian Journal of Infectious Disease* 12(1): 89-93.

Meyers, A., Siegel, B. Vinci, R. 1991. Economic barriers to the use of oral rehydration therapy: A case report. *JAMA* 265(13): 1724-5.

Michael, A. 2011. *Oral Rehydration Salts Solution Use in Children Under 5 Years With Diarrhoea in Arua District, Uganda*, Master Thesis, Makerere University Kampala.

Mihrete, T.S., Alemie, G.A. and Teferra, A.S. 2014. Determinants of childhood diarrhea among under5 children in Benishangul Gumuz Regional State, North West Ethiopia. *BMC Pediatric* 14: 102.

Muir, S. 2002. *Factors Influencing The Maternal Use of Oral Rehydration Solution in The Home Treatment of Childhood Diarrhea in West Java, Indonesia*, Master Thesis., University of Newfoundland.

Mumtaz, Y., Zafar, M. and Mumtaz, Z. 2014. Knowledge attitude and practices of mothers about diarrhea in children under 5 years. *Journal of the Dow University of Health Science Karachi* 8(1): 3-6.

Munos, M.K., Walker, C.L.F. and Black, R.E. 2010. The effect of oral rehydration solution and recommended home fluid on diarrhoea mortality. *International Journal Epidemiology* 39: 175-187.

Mohammed, S. and Tamiru, D. 2014. The burden of diarrheal disease among children under 5 years of age in Arba Minch District, Southern Ethiopia, and associated risk factors: A cross sectional study. *International Scholarly Research Notice* 6.

Moraes, L.R., Cancio, J.A., Cairncross, S. and Huttly, S. 2003. Impact of drainage and sewerage on diarrhoea in poor urban areas in Salvador, Brazil. *Transactions of The Royal Society of Tropical Medicine and Hygiene* 97(2): 153-8.

Morisky, D.E., Kar, S.B., Chaudry, A.S., Chen, K.R., Shaheen, M. and Chickering. 2002. Update on ORS usage in Pakistan: Results of National Study. *Pakistan Journal of Nutrition* 1(3): 143-150.

Mosites, E., Hacklemen, R., Weum, K.L.M., Pintye, J., Manhart, L.E. and Hawes, S.E. 2012. Bangladesh ORS case study. *Univeristy of Washington Global Health Start Program and Request from Bill & Melinda Gates Foundation*.

Mwambete, K.D. and Joseph, R. 2010. Knowledge and perception of mothers and caregivers on childhood diarrhoea and its managemnet in Temeke Municipality, Tanzania. *Tanzania Journal of Health Research* 12(1): 1-9.

Nguyen, T.V., Van, P.L., Huy, C.L., Gia, K.N. and Weintraub, A. 2006. Etiology and epidemiology of diarrhea in children in Hanoi, Vietnam. *International Journal of Infectious Disease* 10 : 298-308.

- Okoh, B.A.N. and Hart-Alex, B.A. 2014. Home management of diarrhoea by caregivers presenting at the diarrhoea training unit of a Tertiary Hospital in Southern Nigeria.
- Omotade, O.O., Adeyemo, A.A., Kayode, C.M. and Oladepo, O. 2000. Treatment of childhood diarrhea in Nigeria: need for adaptation of health policy and programmes to cultural norms. *Journal Health Population and Nutrition* 18 (3): 139-144.
- Othoro, D.M., Orago, A.I.S.S., Groenewegen, T., Kaseje, O. and Otengah, O.A. 2008. Home management of diarrhea among under5 in a rural community in Kenya: Household perceptions and practices. *East African Journal of Public Health* 5(3) : 142-146.
- Oyemade, A. and Omokhodion, F.O. 1998. Environment and personal hygiene practices: risk factors for diarrhea among children of Nigerian market women. *Journal Diarrheas Disease Research* 16(4): 175-81.
- Ozfoodnet. 2002. A survey of community diarrhoeal illness among adults and young children in Queensland. Queensland OZFOODNET Communicable Disease Unit: Queensland Health.
- Pandey, A., Sengupia, P.G., Mondal, S.K., Gupta, D.N., Manna, B., Ghosh, S., Sur, D. and Bhattacharya, S.K. 2002. Gender differences in healthcare-seeking during common illnesses in a rural community of West Bengal, India. *Journal Health Population and Nutrition* 20(4): 306:11.
- Rabbi, S.E. and Dey, N.C. 2013. Exploring the gap between hand washing knowledge and practices in Bangladesh: A Cross-sectional comparative study. *BMC Public Health* 13: 89-95.
- Raghu, M.B., Balasubramanian, S., Indumathy. and Balasubrahmanyam, G. 1995. Awareness of and attitude toward oral rehydration therapy. *Indian Journal Pediatr* 62(4): 439-43.
- Ram, P.K. Choi, M., Blum, L.S., Wamae, A.W., Mintz, E.D. and Bartlett, A.V., 2008. Declines in case management of diarrhoea among children less than 5 years old. *Bulletin World Health Organization* 86(3): A-F.
- Rao, K.V., Mishra, V.K. and Retherford, D. 1998. Knowledge and use of oral rehydration therapy for childhood diarrhoea in India: Effects of exposure to Mass Media. *National Family Health Survey Subject Report* 10.
- Rasania, S.K., Singh, D., Pathi, S., Matta, S. Singh, S. 2005. Knowledge and attitude of mothers about oral rehydration solution in few urban slum of Delhi. *Health and Population* 28(2): 100-107.
- Rautanen, T., Isolauri, E., Salo, E. and Vesikari, T. 2008. Management of acute diarrhoea with low osmolarity oral rehydration solutions and *Lactobacillus* strain GG. *Arch Disease Child* 79: 157-160.

- Rehan, H.S., Gautam, K. and Gurung, K. 2003. Mothers needs to know more reagrding managemnet of childhood acute diarrhea. *Indian Journal Prevention Social Medicine* 34(1): 40-45.
- Reis, E.C., Goep, J.G., Katz, S. and Santosham, M. 2002. Barriers to use of oral rehydration therapy. *Pediatrics* 93(5): 708-11.
- Rishi, R.K., Bodakhe, S.H. and Tailang, M. 2003. Patterns of use of oral rehydartion therapy in Srinagar (Garhwal), Uttaranchal, India. *Tropical Doctors* 33(3): 143-5.
- Rohmawati, N., Panza, A. and Lertmaharl, S. 2012. Factors associated with diarrhea among children under 5 years of age in Banten Province, Indonesia. *Journal Health Research* 26(1): 31-34.
- Rosenzweiq, M.R. and Schultz, T.P. 1982. Child mortality and fertility in Colombia: individua and community effects. *Health Policy and Education* 2(3-4): 305-48.
- Rudan, I., Nair, H., Marusic, A., and Campbell, H. 2013. Reducing mortality from childhood pneumonia and diarrhoea: The leading priority is also the greatest opportunity. *Journal of Global Health* 3(1): 1-4.
- Rutebemberwa, E., Pariyo, G., Peterson, S., Tomson, G. and Kallander, K. 2009. Utilization of public or private health care provider by febrile children after user fee removal in Uganda. *Malaria Journal* 8: 45.
- Sabot, O., Schroder, K., Yamey, G., Montagu, D. 2012. Scaling up oral rehydration salts and zinc for the treatment of diarrhoea. *BMJ* 344: e940.
- Sargeant, J.M., Majowicz, S.E. and Snelgrove, J. 2008. The burden of acute gastrointestinal illness in Ontario, Canada, 2005-2006. *Epidemiol Infect* 136: 451-60.
- Sastry, N. and Burgard, S. 2011. Changes in diarrheal disease and treatment among Brazilian children from 1986 to 1996. *P Population research and policy review* 30(1): 81-100.
- Saw, S.M. and Ng, T.P. 2001. The design and assessment of questionnaires in clinical research. *Singapore Medical Journal* 42(3): 131-135.
- Scallan, E., Majowicz, S.E., Hall, G., Banerjee, A., Bowman, C.L., Daly, L., Jones, T., Kirk, M.D., Fitzgerald, M. and Angulo, F.J. 2005. Prevalence of diarrhoea in the community in Australia, canda, Ireland and the United States. *International Journal Epidemiology* 34(2): 454-60.
- Segeren, S., Soenarto, Y., and Juffrie, M. 2005. Cairan rehidrasi oral tidak tepat merupakan faktor risiko kejadian hipernatremia pada anak balita dengan diare cair akut. *Sari Pediatri* 37: 4.

- Shah, M.S., Ahmad, A., Khaliq, N., Afzal, S., Ansari, M.A. and Khan, Z. 2012. Home-based management of acute diarrhoeal disease in an urban slum of Aligarh, India. *Journal Infect Dev Ctries* 6(2): 137-142.
- Shahunja, K.M., Sayeem, A.S.M., Faruque, A.S.G., Das, S.K., Kamaruzzaman., Flora, F.P. and Chisti, M.J. 2013. Predictors of death in under 5 children with Sepsis attending an urban diarrheal treatment centre in Bangladesh. *Food and Nutrition Science* 4: 709-714.
- Sodemann, M., Jakobsen, M.S., Molbak, K., Martins, C. and Aaby, P. 1999. Management of childhood diarrhea and use of oral rehydration salts in a Suburban West African community. *American Journal Tropical Medicine and Hygiene* 60(1): 167-171.
- Soenarto, Y.S. 2008. Penelitian translasional dan kebijakan berbasis bukti: Diare pada anak sebagai studi kasus. Fakultas Kedokteran: Universitas Gadjah Mada.
- Sreeramareddy, T.C., Shankar, P.R., Sreekumara, V.B., Subba, H.S., Joshi, S.H. and Ramachandran, U. 2006. Care seeking behaviour for childhood illness, a questionnaire survey in western Nepal. *BMC International Health Human Rights* 6:7.
- Statistics Indonesia (SI). 2007. Hasil Susenas 2006. Statistics Indonesia: Jakarta. Retrieved from <http://www.bps.go.id/sector/socwel/table1shtml>
- Sultana, A., Riaz, R., Ahmed, R. and Khurshid, R. 2010. Knowledge and attitude of mothers regarding oral rehydation salt. *Journal of Rawalpindi Medical College* 14(2): 109-111.
- Tam, C.C. 2008. Fortune and foreigners: toward epidemiology of food (borne illness). *Epidemiology* 19(2): 291-3.
- Tee, G.H., Kaur, G., Ramanathan, P., Amal, N.M. and Chinna, K. 2011. Health seeking behaviour among malaysians with acute diarrheal disease. *Southeast Asian Journal Medical Public Health* 42(2): 424-434.
- Thapar, N. and Sanderson, I.R. 2004. Diarrhoea in children: an interface between developing and developed countries. *Lancet* 363: 641-53.
- Thomas, M.K., Majowicz, S.E., MacDougall, L., Sockett, P.N., Kovacs, S.J., Fyfe, M., Edge, V.L., Dore, K., Flint, J.A., Henson, S. and Jones, A.Q. 2006. Population distribution and burden of acute gastrointestinal illness in British Columbia, Canada. *BMC Public Health* 6: 307.
- Thomas, D., Strauss, J. Henriques, M.H. 1991. How does mother's education affect child height?. *The Journal of Human Resources* 26(2): 183-211.
- United Nations Children's Fund (UNICEF). 2012. Pneumonia and diarrhoea : Tackling the deadliest disease for the world's poorest children. New York: UNICEF.

- United National Children's Fund (UNICEF). 2014b. Committing to child survival: A Promise Renewed. *Progress Report 2014*. Retrieved from [http://files.unicef.org/publications/files/APR\\_2014\\_web\\_15Sept14.pdf](http://files.unicef.org/publications/files/APR_2014_web_15Sept14.pdf)
- United Nations Children's Fund (UNICEF). 2014a. The state of the world's children 2014 in numbers every child counts, pp 3-7. New York: UNICEF.
- Pallant, J. 2005. SPSS survival manual: A step by step guide to data analysis using SPSS for windows (Version 12). In *Preliminary Analyses Descriptive Statistics*, pp. 47-63. Sydney: National Library of Australia.
- Pan America Health Organization (PAHO). 2012. Salud en las Américas. Washington. Retrieved from: [http://new.paho.org/saludenasamericas/index.php?option=com\\_docman&task=doc\\_view&gid=210&Itemid](http://new.paho.org/saludenasamericas/index.php?option=com_docman&task=doc_view&gid=210&Itemid).
- Pham, D.M., Byrkit, M., Pham, H.V., Pham, T. and Nguyen, C.T. 2013. Improving pharmacy staff knowledge and practice on childhood diarrhea management in Vietnam: Are educational interventions effective?. *PLoS One* 8:10.
- Piechulek, H., Al-Sabbir, A. and Aldana-Mendoza, J. 2003. Diarrhea and Ari in Rural areas of Bangladesh. *Southeast Asian Journal Tropical Medicine Public Health* 34(2): 337-42.
- Pinto-Boschi, C., Velebit, L., and Shibuya, K. 2008. Estimating child mortality due to diarrhoea in developing countries. *Bulletin of the World Health Organization* 86(9).
- Pinto-Boschi, C. Bahl, R. and Martines, J. 2009. Limited progress in increasing coverage of neonatal and child-health interventions in Africa and Asia. *Journal Health Population and Nutrition* 27(6): 755-762.
- Vazquez, M.L., Mosquera, M. and Kroeger, A. 2002. People's concepts on diarrhea and dehydration in Nicaragua: the difficulty of the intercultural dialogue. *Rev Bras. Saude Maternal Infant* 2(3): 223-237.
- Vernacchio, L., Vezina, R.M., Mitchell, A.A., Lesko, S.M., Plaut, A.G., and Acheson, D.W.K. 2006. Diarrhea in american infants and young children in the community setting. *The Pediatric Infectious Disease Journal* 25(1): 1-7.
- Walker-Fisher, C.L., Aryee, M.J., Pinto, C.B and Black. R.E. 2012. Estimating diarrhea mortality among young children in low and middle income countries. *PLoS ONE* 7(1): 29151.
- Walker-Fisher, C.L., Fontaine, O. and Black, R.E. 2013. Measuring coverage in MNCH: Current indicators for measuring coverage of diarrhea treatment interventions and opportunities for improvement. *PLoS Medicine* 10:5.

- Walker-Fisher, C.L. and Walker, N. 2014. The lives saved tool (*LiST*) as model for diarrhea mortality reduction. *BMC Medicine for Global Health* 12:70.
- Widarsa, K.T. and Muninjaya, A.A.G. 1994. Factors associated with the use of oral rehydration solution among mothers in west Lombok, Indonesia. *Journal of Diarrhoeal Disease Research* 12(4): 261-264.
- Widjaja, M.C. 2002. Mengatasi diare dan keracunan pada balita. Jakarta: Kawan Pustaka.
- Wilson, S.E., Ouedraogo, C.T., Lea, P., Ouedraogo, A., Hess, S.Y., Rouamba, N., Ouedraogo, J.B., Vosti, S.A. and Brown, K.H. 2011. Caregiver recognition of childhood diarrhea, care seeking behaviours and home treatment practices in Rural Burkina Faso. *PLoS One* 7(3): 300-5.
- Wilson, S.E. Morris, S.S., Gilbert, S.S., Mosites, E., Hackleman, R., Weum, K.L.M., Pitye, J., Manhart, L.E. and Hawes, S.E. 2013. Scaling up access to oral rehydration solution for diarrhea: Learning from historical experience in low-and high-performing countries. *Journal Global Health* 3: 1.
- Winardi, B. 1981. Diare dan upaya pemberantasannya. Jakarta: Ministry of Health Indonesia.
- Wright, C.E., Alamy, M.E., DuPont, H.L., Holguin, A.H., Hsi, B.P., Thacker, S.P., Zaki, A.M., and Habib, M. 1991. The role of home environment in infant diarrhea in Rural Egypt. *American Journal of Epidemiology* 134(8): 887-894.
- Woldemicael, G. 2001. Diarrhoeal morbidity among young children in Eritrea: environmental and socioeconomic determinants. *Journal Health Population and Nutrition* 19(2): 83-90.
- World Health Organization (WHO). 1998. *The selection of fluids and food for home therapy to prevent dehydration from diarrhea*. Geneva: WHO.
- World Health Organization (WHO). 2005. *The treatment of diarrhoea : A manual for physicians and other senior health workers*. Geneva: WHO.
- World Health Organization (WHO). 2013. *Pocket book of hospital care for children: Guidelines for the management of common childhood illnesses* (2<sup>nd</sup> edition), pp. 126-143. Geneva: World Health Organization.
- World Health Organization (WHO) and UNICEF. 2004. Joint Statement: Clinical management of acute diarrhoea. [www.wikipedia.orh/wiki/diarrhea](http://www.wikipedia.orh/wiki/diarrhea)
- World Health Organization (WHO) and UNICEF. 2009. Diarrhoea: Why children are still dying and what can be done. In *The global burden of childhood diarrhoea*, pp. 4-8. New York: UNICEF.

Zubir, Juffrie, M., and Wibowo, T. 2006. Faktor-faktor risiko kejadian diare akut pada anak 0-35 bulan (balita) di Kabupaten Bantul. *Sains Kesehatan* 19(3): 319-322.

Zwisler, G., Simpson, E. Moodley, M. 2013. Treatment of diarrhea in young children: Results from surveys on the perception and use of oral rehydration solutions, antibiotics, and other therapies in India and Kenya. *Journal Global Health* 3(1): 1-14.

