

Menstrual hygiene management among adolescent girls in India: a systematic review and Meta-Analysis

Supplement 1: Methodology and Quality assessment

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Table S1.1: PICOT table PubMed

Framework	Search terms	Number of articles
P Population	(adolescent OR adolescence OR puberty OR peer OR school)	P: 3,922,974
I Intervention or condition	AND (Menstruation OR menstrual OR menses)	I: 20,899 P+I: 16382
C Control	-	
O Outcome	AND (hygiene OR hygienically OR sanitation OR sanitary)	O: 112,907 P+I+O: 397
T Timing	AND ("2000/01/01"[PDat] : "2015/01/31"[PDat])	P+I+O+T: 32
S Setting	AND India	S: 252,289 P+I+O+T+S: 24

Search date: 2 February 2015, 24 articles

Table S1.2: PICOT table Global Health Database

Framework	Search terms	Number of articles
P Population	(adolescent OR adolescence OR puberty OR peer OR school)	P: 374,759
I Intervention or condition	AND (Menstruation OR menstrual OR menses)	I: 5912 P+I: 1447
C Control	-	
O Outcome	AND (hygiene OR hygienically OR sanitation OR sanitary)	O: 295,839 P+I+O: 176
T Timing	AND ("2000-2015")	Custom range
S Setting	AND India	S: 176,436 P+I+O+T+S: 34

Search date 2 February 2015, 34 Articles

Google Scholar: Search date 2 February 2015, 21 Articles (sort by date) (Menstruation OR menstrual OR menses) AND (adolescent OR adolescence OR puberty OR peer OR school) AND (hygiene OR hygienically OR sanitation OR sanitary) AND India, custom range 2000-2015: > 20,000 results, screened pages until saturation (2 pages without new references). This occurred after 8 pages.

The search was repeated on 19 September 2015 for the year 2015, when 20 new references were added.

Table S1.3: Elements of the data extraction form for the review on menstrual hygiene management among adolescent girls in India, studies published between 2000 and 2015

	Description	Notes
1	Characteristics of material: first author, year, type of material (article, report) Characteristics of study: design, sample size, location, study period, urban or rural, study population, who administered questionnaire, time Inclusion and exclusion criteria, sample size An indicator of age of the study population	Mean, sd, or median and IQR, or range, or groups
2	An indicator of SES, religion, maternal education or other	Mean, sd, or median and IQR, or range, or groups
3	An indicator of menarche	Mean, sd, or median and IQR, or range, or groups
4	Menarche: Knowledge of menarche, source of information, reaction to menarche	
5	Material used for period: cloth, pads, both, how disposed, how cleaned, reuse, changing, how often, where	
6	Hygiene during period: baths, washing habits, soap use, frequency	
7	Restrictions during period: related to religion, touching, cooking, sitting or sleeping in house, getting out of the house, diet, physical activities, schooling/education, household work, family functions, type of clothing, interactions with boys, personal hygiene, other, none	
8	Knowledge about period: where does blood come from, is it normal, what is the reason for the period, what is the normal duration, etc	
9	Perception of period: debilitating, bothersome, or no negative effect on women's performance	
10	Menstrual problems: dysmenorrhoea (pain), irregular, other	
11	External problems: toilet situation at school or at home, school absenteeism, privacy, other	
12	Any associations reported	
13	Qualitative information	
14	Interventions described	
15	Boys and menstruation	
16	Any other issues	
17	Reference check	

Section SI.4: Additional information on data synthesis

A considerable proportion of studies did not report when the study was conducted. We calculated the median difference between publication and year of study for the studies where this was known (median was 2 years in 67 studies), and extrapolated this difference to 51 studies with unreported time of study. To assess time trends the year of study was recorded; for studies covering more than one year, the last year was used in order to be consistent with the studies where we extrapolated the period of study. Not all studies had information for all the components we examined in the framework, and some studies presented a wealth of information. We focussed on certain variables related to knowledge, attitude and practice, and sources of information with regards to menstrual hygiene, based on reliability, reporting frequency, and perceived importance by the review authors. The following outcomes were selected for further analysis based: awareness of menarche before the start of menstruation, and sources of the awareness; knowledge of source of bleeding, perception of menstruation as a normal phenomenon, resources for menstruation, type of absorbent used, disposal of absorbent, daily bath during period, restrictions reported, and school absenteeism during the menstruation.

For meta-regression, study-level predictors were considered for inclusion in the initial models if the p-value for the univariate association of that variable with the endpoint was <0.2 . Backwards elimination was conducted whereby variables were removed if the p-value was > 0.1 or all p-values for the individual levels were >0.1 in the multivariate model. We examined for interaction if there was more than one variable in the main model.

Section S1.5: Quality assessment

Quality-assessments of included studies were conducted by the same reviewers based on the following criteria: presence of a sample size calculation, randomness of sample, description and appropriateness of inclusion and exclusion criteria, presence of a description of the number of persons approached but not enrolled, or enrolled but data not used, completeness of outcome data for the number which was presented, presence of study characteristics and of multivariate analysis for the outcome of the paper. To score for randomness of sample, some description of the process was required. With regards to study characteristics, at least 3 of the four following components were expected to be present: year of conduct of the study, location of the study, an indicator of age of the participants, and another characteristic of the participants, such as socio-economic status, parental education, religion, or type of family (nuclear, extended or joint). A study did not receive a score of 1 for this item if two or more of these components were missing. A study was considered moderate-to-good, if at least 5 criteria had been satisfied.

Table S1.6: Summary of quality assessment of 138 included studies on MHM, India, 2000 to 2015

Variable	Values	Number (%)	
Sample size calculation present	Yes	35	(25.4)
	No	102	(73.9)
	Not applicable	1	(0.7)
Random sample	Yes	40	(29.0)
	No	98	(71.0)
Inclusion and exclusion criteria described and adequate	Yes	62	(55.1)
	No	76	(55.1)
Denominator or refusals or incomplete forms reported?	Yes	26	(18.8)
	No	112	(81.2)
Complete outcome data	Yes	138	(100)
	No	0	
Characteristics presented	Yes	96	(69.6)
	No	42	(30.4)
Multivariate analysis done	Yes	14	(10.1)
	No	124	(90.0)
Quality	Score > 4	27	(19.6)
	Score ≤4	111	(80.4)
Mean score (standard deviation)		3	(1.5)

Table S1.7: Individual quality assessment of 138 sources included in the review of the status of menstrual hygiene management among adolescent girls in India, studies published between 2000 and 2015

Author/year, type of material	Sample size calculation present	Inclusion/exclusion criteria described and adequate for study purpose	Random sample	Loss to enrolment or incomplete data described	Complete outcome data for included participants	Characteristics described (age, year of study, location)	Multivariate analysis conducted for study outcome	Assessment quality for review
Ade 2013 ¹	0	1	0	0	1	1	0	3
Amirtha 2013 ²	0	0	0	0	1	1	0	2
Anand 2015 ³	0	1	1	1	1	1	1	6
Anitha 2015 ⁴	0	0	0	0	1	0	0	1
Anuradha 2000 ⁵	1	1	1	0	1	1	1	6
Anusree 2014 ⁶	0	0	0	0	1	1	0	2
Arora 2013 ⁷	0	1	1	1	1	1	0	5
Arunmozhi 2013 ⁸	1	1	1	0	1	1	0	5
Audinarayana 2005 ⁹	0	1	0	0	1	1	1	4
Avachat 2011 ¹⁰	0	0	0	0	1	1	0	2
Avasarala 2008 ¹¹	0	0	0	0	1	0	0	1
Balasubramanian 2005 ¹²	0	0	0	0	1	1	0	2
Barathalakshmi 2014 ¹³	1	1	0	0	1	1	0	4
Baridalyne 2004 ¹⁴	0	1	1	0	1	1	0	4
Bathija 2013 ¹⁵	0	1	0	0	1	1	0	3
Bhattacharjee 2013 ¹⁶	1	1	1	1	1	1	0	6
Bhore 2014 ¹⁷	0	0	0	0	1	1	0	2
Bhudhagaonkar 2014 ¹⁸	0	1	0	0	1	1	0	3
Bobhate 2011 ¹⁹	0	1	0	0	1	1	0	3
Bodat 2013 ²⁰	0	1	0	0	1	1	0	3
Boratne 2014 ²¹	1	1	0	1	1	1	0	5
Borker 2014 ²²	0	0	1	0	1	1	0	3
Chothe 2014 ²³	0	0	0	1	1	0	0	2
Dambhare 2012 ²⁴	0	1	0	1	1	1	0	4
Dasgupta 2008 ²⁵	0	0	0	0	1	1	0	2
Datta 2012 ²⁶	0	1	1	1	1	1	0	5
Deo 2007 ^{27,28}	0	1	0	0	1	0	0	2
Dhingra 2009 ²⁹	0	0	0	0	1	1	0	2
Dongre 2007 ³⁰	1	1	1	1	1	1	0	6
Dube 2012 ³¹	0	0	0	0	1	0	0	1
Dugani 2015 ³²	0	0	0	0	1	1	0	2
Dutta 2006 ³³	0	1	0	0	1	1	0	3
Garg 2001 ³⁴	0	0	0	1	1	1	0	3
Goel 2011 ³⁵	1	0	0	0	1	0	0	2
Gosavi 2015 ³⁶	0	0	0	0	1	1	0	2
Gujarathi 2014 ³⁷	0	0	0	0	1	0	0	1
Gupta 2001 ³⁸	0	0	0	0	1	1	0	2
Gupta 2006 ³⁹	0	0	0	1	1	1	0	3
Jain 2009 ⁴⁰	1	0	0	0	1	0	0	2
Jain 2012 ⁴¹	0	1	0	0	1	0	0	2
Jogdand 2011 ⁴²	0	1	1	0	1	0	0	3
Jothy 2012 ⁴³	0	0	0	0	1	1	0	2
Juyal 2013 ⁴⁴⁻⁴⁶	1	0	1	0	1	1	0	4
Jyothi 2005 ⁴⁷	0	0	1	0	1	0	0	2
Kale Kalpana 2014 ⁴⁸	0	1	0	1	1	0	0	3
Kamaljit 2012 ⁴⁹	0	0	0	0	1	1	0	2
Kamath 2013 ⁵⁰	1	0	1	0	1	1	0	4
Kanotra 2013 ⁵¹	0	0	0	0	1	0	0	1
Katiyar 2013 ⁵²	1	0	0	0	1	1	0	3
Katkuri 2014 ⁵³	0	0	0	0	1	1	0	2
Kavitha 2012 ⁵⁴	0	0	0	0	1	0	0	1
Kendre 2013 ⁵⁵	0	0	1	1	1	1	0	4
Khan 2012 ⁵⁶	0	1	1	0	1	1	0	4
Khanna 2005 ⁵⁷	0	0	1	1	1	1	1	5
Kumar 2011 ⁵⁸	0	0	0	0	1	0	0	1
Kumar 2012 ⁵⁹	1	1	0	1	1	1	0	5
Kumar 2013 ⁶⁰	1	1	1	0	1	1	0	5
Kumar 2015 IJCRR ⁶¹	1	0	0	0	1	1	0	3
Kumar 2015 IMG ⁶²	0	1	0	0	1	0	0	2
Kumari 2014 ⁶³	0	0	0	0	1	0	0	1

Author/year, type of material	Sample size calculation present	Inclusion/exclusion criteria described and adequate for study purpose	Random sample	Loss to enrolment or incomplete data described	Complete outcome data for included participants	Characteristics described (age, year of study, location)	Multivariate analysis conducted for study outcome	Assessment quality for review
Kushwah 2007 ⁶⁴	0	0	0	0	1	1	0	2
Lakshmi 2013 ⁶⁵	0	0	0	0	1	0	0	1
Lalbiaknungi 2015 ⁶⁶	0	1	0	0	1	1	0	3
Leuva 2014 ⁶⁷	0	1	0	0	1	1	0	3
Mahajan 2004 ⁶⁸	0	0	0	0	1	0	0	1
Mallesappa 2011 ⁶⁹	1	1	1	0	1	1	0	5
Manhas 2015 ⁷⁰	0	0	1	0	1	0	0	2
Manjula 2012 ⁷¹	1	0	1	0	1	0	0	3
Mehta 2013 ⁷²	0	0	0	0	1	1	0	2
Minhas 2014 ⁷³	0	1	0	0	1	0	0	2
Misra 2013 ⁷⁴	1	1	1	1	1	1	0	6
Mittal 2010 ⁷⁵	1	0	0	0	1	0	0	2
Mudey 2010 ⁷⁶	0	1	0	1	1	0	0	3
Nagamani 2014 ⁷⁷	0	1	0	0	1	1	0	3
Nagar 2010 ⁷⁸	0	0	1	0	1	1	0	3
Nair 2007 ⁷⁹	0	1	0	0	1	1	0	3
Nair 2012 ⁸⁰	0	1	1	0	1	0	0	3
Narayan 2001 ⁸¹	0	0	0	1	1	0	1	3
Nemade 2009 ⁸²	0	0	0	0	1	0	0	1
Nielsen 2012 Jaunpur ⁸³	1	1	1	0	1	1	0	5
Nielsen 2012 Mirzapur ⁸⁴	1	1	1	0	1	1	0	5
Nielsen 2012 Sonebhadra ⁸⁵	1	1	1	0	1	1	0	5
Nielsen 2013 East Singhbhum ⁸⁶	1	1	1	0	1	1	1	6
Nielsen 2013 Gumla ⁸⁷	1	1	1	0	1	1	1	6
Nielsen 2013 Nalanda ⁸⁸	1	1	1	0	1	1	1	6
Nielsen 2013 Vaishali ⁸⁹	1	1	1	0	1	1	1	6
Omidvar 2010 ⁹⁰	0	0	0	0	1	1	1	3
Omidvar 2011 ⁹¹	0	1	0	0	1	1	0	3
Padhy 2013 ⁹²	0	0	0	0	1	1	0	2
Pandit 2014 ⁹³	0	1	1	1	1	1	0	5
Parameaswari 2014 ⁹⁴	1	1	1	0	1	1	0	5
Paria 2014 ⁹⁵	0	1	0	0	1	1	0	3
Parwej 2005 ⁹⁶	1	0	1	0	1	1	1	5
Patavegar 2014 ⁹⁷	1	1	0	0	1	1	0	4
Pathak 2015 ⁹⁸	0	0	0	0	1	0	0	1
Patil 2013 ⁹⁹	0	1	0	0	1	0	0	2
Patle 2014 ¹⁰⁰	1	0	0	0	1	0	0	2
Pokhrel 2014 ¹⁰¹	0	1	0	1	1	1	0	4
Preeti 2015 ¹⁰²	0	0	0	0	1	1	0	2
Premila 2015 ¹⁰³	0	0	0	0	1	1	0	2
Prerana 2015 ¹⁰⁴	0	1	0	0	1	1	0	3
Puri 2006 ¹⁰⁵	0	0	1	0	1	0	0	2
Raddi 2010 ¹⁰⁶	0	0	0	0	1	1	0	2
Rana 2015 ¹⁰⁷	1	1	1	0	1	1	0	5
Rani 2014 ¹⁰⁸	0	0	0	0	1	1	1	3
Rao 2008 ¹⁰⁹	1	0	1	0	1	1	0	4
Ravishankar 2011 ¹¹⁰	0	0	0	0	1	1	0	2
Reddy 2005 ¹¹¹	0	0	0	0	1	1	0	2
Salve 2012 ¹¹²	0	0	0	0	1	0	0	1
Sanyal 2008 ¹¹³	0	1	0	0	1	1	1	4
Sarkar 2012 ¹¹⁴	0	1	0	1	1	1	0	4
Sekhon 2014 ¹¹⁵	0	0	0	0	1	1	0	2
Shah 2013 ¹¹⁶	0	1	1	1	1	1	0	5
Shamima 2013 ¹¹⁷	0	1	1	0	1	1	0	4
Shanbhag 2012 ¹¹⁸	0	1	0	0	1	1	0	3
Sharma 2008 ¹¹⁹	0	1	0	1	1	1	0	4
Shetty 2001 ¹²⁰	0	0	0	0	1	1	0	2
Shitole 2012 ¹²¹	0	0	0	0	1	0	0	1
Singh 2006 ¹²²	0	0	0	0	1	0	0	1
Singh 2006_IJCM ¹²³	0	0	0	0	1	0	0	1

Author/year, type of material	Sample size calculation present	Inclusion/exclusion criteria described and adequate for study purpose	Random sample	Loss to enrolment or incomplete data described	Complete outcome data for included participants	Characteristics described (age, year of study, location)	Multivariate analysis conducted for study outcome	Assessment quality for review
Singh 2013 ¹²⁴	1	0	0	0	1	1	0	3
Singh 2015 ¹²⁵	0	0	0	0	1	1	0	2
Solanki 2012 ¹²⁶	0	0	0	0	1	0	0	1
Sudeshna 2012 ¹²⁷	1	1	1	1	1	1	1	7
Sumana 2015 ¹²⁸	0	0	0	0	1	0	0	1
Susila 2014 ¹²⁹	0	0	0	0	1	1	0	2
Susmitha 2010 ¹³⁰	0	1	0	1	1	1	0	4
Thakre 2011 ¹³¹	1	0	0	0	1	1	0	3
Thakur 2014 ¹³²	0	1	1	0	1	1	0	4
Tiwari 2006 ¹³³	0	0	0	0	1	0	0	1
Udgiri 2010 ¹³⁴	0	0	0	1	1	1	0	3
Unni 2010 ¹³⁵	0	0	0	0	1	0	0	1
Venkatesh 2011 ¹³⁶	0	0	0	0	1	0	0	1
Verma 2011 ¹³⁷	0	0	0	0	1	0	0	1
Verma 2013 ¹³⁸	0	0	0	0	1	1	0	2
Vidya 2013 ¹³⁹	1	1	0	1	1	1	0	5
Zaidi 2015 ¹⁴⁰	0	1	0	0	1	1	0	3
Zanvar 2007 ¹⁴¹	0	0	0	0	1	0	0	1

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