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A study of practices of menstrual health among school going girls of Kalaburagi district *

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Abstract This paper presents a study of health problems facing during menstruation among school going girls of Kalaburagi district. The main objective of the study is to identify and analyze the most influencing health factors and measures of precaution during menstruation using factor analysis. The respondents were selected randomly from high schools of five talukas of Kalaburagi district viz: Aland, Jevargi, Sedam, Chitapur and Kalaburagi with 1500 respondents. In this study 18 factors were considered and most decisive health and precaution factors were identified through factor analysis using SPSS package.

Key words Menstruation, Health factors, Factor Analysis, Component matrix, Rotated Component matrix.

2010 Mathematics Subject Classification 62H25.

1 Introduction

Menstrual cycle is the physiological process which results in the discharge of blood from the uterus of a human female, who has attained the age of puberty, till the attainment of her age of menopause, normally at monthly intervals. This whole process involves many complex actions of a number of hormones in the body of a woman, therefore, often a woman has to suffer from the various discomforts during the tenure of her periods almost every month during her reproductive life (fertility period) span beginning from about twelve years of her age and lasting almost up to fifty years or a little more. During this phase of life most of the women often face a number of major problems due to menstruation which are of a gynecological nature. The most common external symptoms of discomforts suffered by many women during their periods are acne (often during the early years of puberty or adolescence), insomnia or change in appetite. Some women also experience fatigue, constipation, backache, headache, abdominal pain, vaginal infections, pruritus vulvae, fetid leucorrhoeal discharge, etc. and in many women hot flashes also occur during the climacteric. Joint pain or abdominal (menstrual) pain, mood swings and heaviness or bloating of abdomen also occur in some women during

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menstruation. Abdominal cramps are the worst among the menstrual pain that really bother all the normal activities of the life of a woman [2].

Many studies have been conducted in India and abroad focusing on menstrual hygiene, assessment of knowledge, belief sourcing information regarding menstruation among the adolescent girls, but so far a very few studies are conducted which primarily address the health problem issues related to menstruation faced by the adolescent school going girls. Hence the present study is undertaken among the adolescent school going girls of Kalaburagi district of the State of Karnataka in India. The main objective of the study is to identify and analyze the most influential health factors which govern the majority of health problems faced by the young school going girls who are often very shy and hesitant to discuss their menstruation related problems with their parents (especially, mothers), friends and other well wishers and to suggest the measures of precaution that needed to be followed by the young adolescent school going girls during menstrual periods by utilizing the statistical techniques of factor analysis. In this study 18 health factors are considered and a number of most decisive health factors are identified and many precautionary measures are suggested by employing the factor analysis using SPSS package.

2 Survey of literature

The study of Oche et al. [4] aimed to assess the level of knowledge on menstruation and hygienic practices among adolescent school girls in the urban city of Sokoto in Nigeria. The study was a cross sectional survey and a total 122 girls from 4 out of the 9 school's were recruited using a multistage sampling technique to select the schools, and systematic sampling method proportionate to size (proportion of total study unit accounted by each school) after a random selection of the first respondent, using the list of students as the sampling frame and sampling interval of 30. Overall, a total of 79 (65%) of the respondents had high knowledge. 15% of respondents indicated their major source of information on menstruation from their school teachers. There is a significant gap in knowledge and with minimal role played by the school environment to provide appropriate information during their formative years. The ages of the respondents ($P = 0.93$), education of their mothers ($P = 0.173$) and the sources of information regarding menstruation ($P = 0.575$) were found not to be statistically significant with respect to the knowledge of menstruation while there was a statistically significant relationship between religion ($P = 0.0001$) and level of study of the girls and knowledge of menstruation ($P = 0.048$). Concerning the practice of menstrual hygiene, the majority 106 (87%) of the girls used sanitary pads only. There was a significant statistical association between education of their mothers ($P = 0.015$), religion ($P = 0.0001$) and occupation of respondents mother ($P = 0.0028$) with respect to the reported menstrual hygiene practices.

Sommer et al. [3] found that in recent years, the menstrual hygiene management challenges facing schoolgirls in low-income-country contexts have gained global attention. These authors applied Gusfield's sociological analysis of the culture of public problems to better understand how this relatively newly recognized public health challenge rose to the level of global public health awareness and action. Similarly they applied the conceptualization by Dorfman et al. of the role of public health messaging in changing corporate practice to explore the conceptual frames and the news frames that are being used to shape the perceptions of menstrual hygiene management as an issue of social justice within the context of public health. The analysis suggests that interest and action on the issue of Menstrual Health Management (MHM) had their initial origins in the global concern for narrowing the gender gap in education. Important lessons were revealed for getting other public health problems onto the global, national, and local level agendas.

Williams and Creighton [5] found that menstrual disorders are common in adolescent girls. Periods can be irregular, heavy and/or painful, especially in the first few years following menarche. Serious pathology is rare, however, menstrual dysfunction can have a significant effect on daily activities and result in school absence. There are many treatment options which are safe to use in adolescents, although the evidence for their use is extrapolated from the adult data. This paper [5] presents a clinical review of the current practice, including management of girls with other medical problems and learning difficulties. In addition, the girls with learning difficulties and their families may find even normal menstruation difficult to manage owing to pain, fear or hygiene related issues and they may request intervention.

3 KMO and Bartlett's Test

Fig. 1: **Table 1:** KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Approx. Chi-Square		7443.772
Bartlett's Test of Sphericity	Df	153
	Sig.	.000

From the Table 1 (Fig. 1) the KMO calculated value 0.704 is greater than 0.5, which indicates that the data is adequate. The Bartlett's test is another indication of the strength of the relationship among the variables. In our study Bartlett value < 0.05 , which indicates the multi normality among the variables.

4 Analysis of descriptive statistics

The results of analysis of descriptive Statistics for all the variables under investigation are presented below.

The mean, standard deviation and number of respondents (N) who participated in the survey are given in Table 2 (Fig. 2), which is a table of descriptive statistics for all the variables and which shows the mean rating and standard deviations of the 18 factors regarding health problems faced by the school going girls during their periods. The mean ranged from 2.78 to 3.14, while the standard deviation varied from 1.051 to 1.381.

5 The initial factor analysis solution (Extraction Method: PCA)

Communalities: The communalities which shows how much of the variance in the variables has been accounted for by the extracted factors for instances 89% of the variance in factors "heavy bleeding", "spotting", "medicine prescribed by doctor" are accounted for while, 87% in "how many times you consulted the doctor" (Table 3 (Fig. 3)).

Initial: By definition, the initial values of communality in principal components analysis are always 1.

Extraction: Extraction is the final estimate of the communality which is given in the third column of the Table 3 (Fig. 3). The value in this column indicates the proportion of each variables variance that can be explained by the principal components. The variables with high values are well represented in the column of the extraction space. The Table 3 (Fig. 3) shows the initial and final communalities for each factor.

6 Total variance explained

Eigen value actually reflects the number of excreted factors whose sums should be equal to number of items which are subjected to factor analysis. The next item shows all the factors extract table from the analysis along with their eigen values. Eigen value table has been divided into three sub sections, that is, initial eigen values, excreted sums of squared loadings and rotation sums of square loadings. The factors greater than 1 are considered as the most influencing factors. This is determined by examining the total variance explained shown in the Table 4 (Fig. 4).

Component- There are as many components extracted during a principal components analysis as there are variables that are put into it. In our study, we used 18 variables and 8 components are extracted.

Fig. 2: **Table 2:** Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
IRPMC_1	2.82	1.185	1500
HB_2	2.83	1.161	1500
SPOTTING_3	3.02	1.228	1500
ABP_4	2.93	1.164	1500
BACKP_5	2.96	1.153	1500
SLEEP_6	2.83	1.201	1500
WEAK_7	3.02	1.214	1500
INFECTION_8	2.86	1.128	1500
DW_9	3.14	1.381	1500
DIRRV_10	2.79	1.320	1500
CD_11	2.85	1.116	1500
PLAY_12	2.93	1.112	1500
RASH_13	2.78	1.073	1500
MPD_14	2.85	1.113	1500
ANTIB_15	2.94	1.051	1500
DPM_16	2.84	1.107	1500
YOGA_17	2.79	1.100	1500
DIP_18	3.03	1.108	1500

Initial Eigen Values- Initial eigen values are the variance of the principle components in which the communalities are one. Because we conducted our principal component analysis on the correlation matrix, the variables are standardized, which means that the each variable has a variance of 1, and the total variance is equal to the number of variable used in the analysis, in our case 18. The final communalities are estimated by iteration for the principal axis factor analysis, as mentioned earlier. As can be seen from the 5 they are somewhat less than one, and the amount of variance accounted for is reduced, as can be seen in the Table 4 (Fig. 4) in the section titled extraction sums of squared loadings. The rest of the factor analysis is based on first six factors, because first six factors have eigen values greater than one.

Total- This column contains the eigen values. The first factor will always account for the maximum variance and the next factor will account for lesser variance compared to the first factor as observed and so on. Hence each succeeding factor will account for lesser and lesser variance.

Percentage of Variance- This column contains the percent of variance accounted for by each principal component. The knowledge factors whose percentage of variance accounted for the maximum are further considered for extraction sums of squared loadings and factors sums of squared loadings.

In our case the first eight components total eigenvalues are greater than 1. The total eigenvalues for the first component are 3.237 which is accounted for 17.982% of variance extracted. For the second component the total eigenvalues are 1.868 which accounts for 10.379% of variance. For the third component the total eigenvalues are 1.658 which accounts for 9.210% of variance. For fourth

Fig. 3: **Table 3:** Communalities.

	Initial	Extraction
IRPMC_1	1.000	.471
HB_2	1.000	.889
SPOTTING_3	1.000	.887
ABP_4	1.000	.743
BACKP_5	1.000	.537
SLEEP_6	1.000	.309
WEAK_7	1.000	.569
INFECTION_8	1.000	.504
DW_9	1.000	.540
DIRRV_10	1.000	.546
CD_11	1.000	.873
PLAY_12	1.000	.825
RASH_13	1.000	.506
MPD_14	1.000	.858
ANTIB_15	1.000	.708
DPM_16	1.000	.828
YOGA_17	1.000	.818
DIP_18	1.000	.680

Extraction Method: Principal Component Analysis.

component the total eigenvalues are 1.169 which is accounted for by 6.496% of variance. For the fifth component the total eigenvalues are 1.093 which is accounted for by 6.072% of variance extracted. For the sixth component the total eigenvalues are 1.043 which is accounted for by 5.795% of variance extracted. For the seventh component the total eigenvalues are 1.018 which is accounted for by 5.657% of the variance extracted. Lastly, for the eighth component the total eigenvalues are 1.004 which is accounted for by 5.576% of the variance extracted.

Cumulative Percentage- This column contains the cumulative percentage of variance accounted for by the current and all preceding principal components. For example, the eighth row shows a value of 67.167. This means that the first seven components together account for 67.167% of the total variance.

Extraction Sums of Squared Loadings- The six columns of this half of the table exactly reproduce the values given on the same row on the left of the table. The number of rows reproduced on the right side of the table is determined by the number of principal components whose eigenvalues are 1 or greater.

Rotation sum of squared loadings- In the final part of the table labeled rotation sum of squared loadings, the eigenvalues of the factors after rotation are displayed. Rotation has the effect of optimizing the factor structure and one consequence for data is that the relative importance of eight factors is equalized. Before rotation, factor one accounted for considerably more variance than the remaining seven, that is 17.982% variance compared with 10.379%, 9.210%, 6.496%, 6.072%, 5.795%, 5.657%, 5.576%, however after extraction it accounts for 17.902% of variance compared with 10.272%, 9.211%, 6.312%, 5.985%,

Fig. 4: **Table 4:** Total Variance Explained.

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.237	17.982	17.982	3.237	17.982	17.982	3.222	17.902	17.902
2	1.868	10.379	28.361	1.868	10.379	28.361	1.849	10.272	28.173
3	1.658	9.210	37.571	1.658	9.210	37.571	1.658	9.211	37.384
4	1.169	6.496	44.067	1.169	6.496	44.067	1.136	6.312	43.696
5	1.093	6.072	50.139	1.093	6.072	50.139	1.077	5.985	49.681
6	1.043	5.795	55.934	1.043	5.795	55.934	1.063	5.903	55.585
7	1.018	5.657	61.591	1.018	5.657	61.591	1.046	5.811	61.395
8	1.004	5.576	67.167	1.004	5.576	67.167	1.039	5.772	67.167
9	.985	5.472	72.639						
10	.951	5.282	77.922						
11	.939	5.218	83.140						
12	.888	4.934	88.074						
13	.849	4.717	92.791						
14	.418	2.324	95.115						
15	.340	1.891	97.006						
16	.224	1.247	98.253						
17	.192	1.065	99.318						
18	.123	.682	100.000						

Extraction Method: Principal Component Analysis.

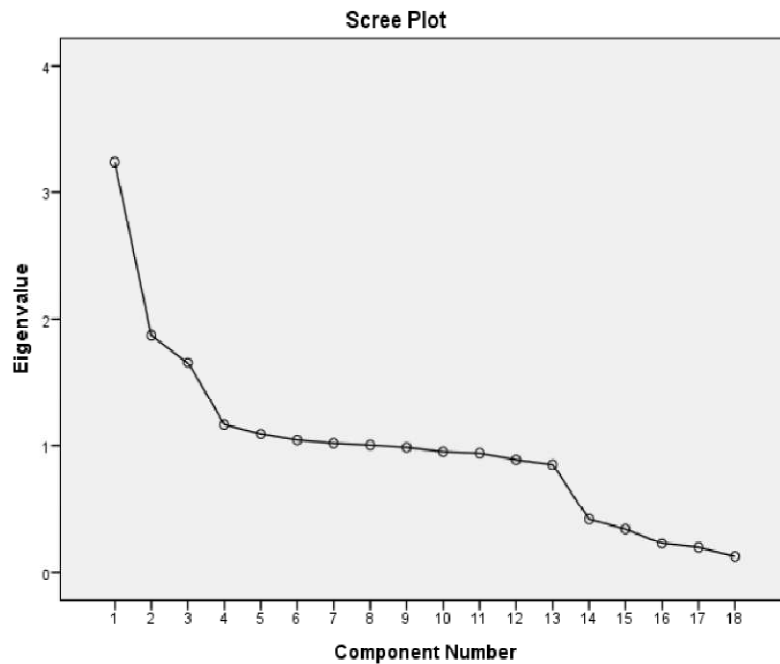
5.903%, 5.811%, 5.772%.

7 Scree test

The scree plot (Fig. 5) is graph of the eigenvalues against all the factors. The graph is useful for determining how many factors to retain. The point of interest is where the curve start to flatten.

The scree plot graph plots the eigenvalues against the component numbers. From the scree plot graph (Fig. 5) it is clear that the first eight components viz; irregularity in cycle, heavy bleeding, spotting during cycle, abdominal pain during cycle, backache during cycle, sleepiness during cycle, weakness during cycle, infection during cycle account for maximum variance and from ninth component and onwards viz., ability to do domestic work, 'are you facing primary dysmenorrhea'/irritability/headache/vomiting, how many time consulted doctor, do you able to play and exercise, do 'you get rashes'/unitary tract infection, medicines prescribed by doctor, to avoid infection do you using anti bacterials/sanitizers/homemade remedies, medicine prescribed by doctor, practicing yoga/exercise, discuss menstruation related issues with parents/friends/doctor accounts for smaller and smaller amounts of total variation in the data and one can observe from this scree plot that the curve exhibits an almost decreasing pattern. We are interested in keeping only those principal components whose eigenvalues are greater than one, that is, only eight factors viz; irregularity in cycle, heavy bleeding, spotting during cycle, abdominal pain during cycle, backache during cycle, sleepiness during cycle, weakness during cycle and the infection during cycle are retained.

Fig. 5: Scree Plot



8 Component matrix

The Table 5 (Fig. 6) shows the loadings of 18 variables on the eight factors extracted. The higher absolute value of loading implies that the more the factor contributes to the variable. Rotation of factors helps in the better interpretation of factors. The Table 5 (Fig. 6) represents the components loadings for item (prior to rotation). The factor with highly loaded factor values is considered first and the next highest and similarly for all the factors. The factors with highly loaded values (which are greater than 0.5) are presented boldly in each component.

9 Rotated component matrix

The idea if rotation is to reduce the number of factors on which the variables under investigation have high loadings. Rotation makes interpretation of the analysis easier.

The rotated component matrix (Table 6 (Fig. 7)) displays the factor loading for each item on each rotated component, which helps in better interpretation of factors. Looking at the above table, we can see that the factor spotting during cycle is heavily loaded on component two. The factors how many time do you consulted doctor, medicines prescribed by doctor, for pain relief do you prefer doctor prescribed medicine, discuss menstrual related issue with parents/friends/doctor are heavily loaded on component one, while the factors are you able to play and exercise and are you practicing yoga/exercise to avoid medicine are heavily loaded on component three, the factors abdominal pain during cycle is heavily loaded on component eight, the factors to avoid infection, are you using anti bacterial/sanitizers/homemade remedies is loaded on component five, the factor are you able to do domestic work during cycle is heavily loaded on component seven, infection during cycle and do you get rashes/urinary tract infection are heavily loaded on components four, the factors back pain during cycle and weakness during cycle are heavily loaded on component six. All the other factors are substantially

Fig. 6: **Table 5:** Component Matrix.

	Component							
	1	2	3	4	5	6	7	8
IRPMC_1	.035	.305	.061	-.159	.340	.356	.227	.233
HB_2	-.057	-.919	-.169	.026	.077	.067	.029	-.007
SPOTTING_3	.059	.917	.147	-.001	-.098	-.079	-.064	-.027
ABP_4	-.011	.027	-.051	.175	.430	.091	-.483	.532
BACKP_5	.020	.018	.018	.269	-.283	.106	.544	.276
SLEEP_6	.021	-.047	-.162	.123	-.418	.081	-.107	.268
WEAK_7	.017	.037	-.026	.297	-.302	.598	.132	.109
INFECTION_8	.078	-.002	-.063	.619	-.048	.031	-.268	-.187
DW_9	.056	-.001	.001	.217	.086	-.554	.419	-.004
DIRRV_10	.091	-.007	.074	-.305	-.241	.297	-.177	-.511
CD_11	.933	-.038	-.032	.005	-.005	-.005	-.007	.016
PLAY_12	.041	-.183	.884	.066	.002	-.029	-.041	.042
RASH_13	.070	.131	-.071	.598	.086	-.073	-.131	-.302
MPD_14	.925	-.020	-.029	.023	-.009	.023	.012	-.001
ANTIB_15	.032	.046	-.025	.148	.594	.339	.324	-.331
DPM_16	.908	-.052	-.009	-.011	-.010	-.009	.014	-.003
YOGA_17	.033	-.164	.880	.107	-.009	.048	-.021	.021
DIP_18	.807	-.015	-.017	-.131	.051	-.036	-.026	.081

Extraction Method: Principal Component Analysis.

a. 8 components extracted.

loaded. The heavily loaded factor value in each column of component matrix are considered and tabulated in the Table 8 (Fig. 9) for factor loading values.

10 Component transformation matrix

The component transformation matrix in the Table 7 (Fig. 8) displays the correlation among the components prior to and after the rotation.

11 Factors loadings

The heavily loaded value in each column is considered and tabulated in the following table for factor loading.

12 The interpretation of health problem issues and precautions to be taken during the menstrual cycle

From the Table 8 (Fig. 9) it can be seen that, the first component is heavily loaded by the factors- 'how many time do you consult doctor' with the value 0.932, medicines prescribed by doctor with

Fig. 7: **Table 6:** Rotated Component Matrix.

	Component							
	1	2	3	4	5	6	7	8
IRHMC_1	.038	.248	-.016	-.318	.441	.209	-.053	.256
HB_2	-.013	-.942	.001	-.009	-.023	-.005	-.008	.000
SPOTTING_3	.012	.939	-.019	.059	-.002	-.012	-.008	-.015
ABP_4	.006	-.011	.000	.081	-.011	-.088	-.069	.851
BACKP_5	.010	.011	.035	-.071	-.031	.624	.357	-.114
SLEEP_6	.026	-.035	-.115	.038	-.423	.316	-.061	.076
WEAK_7	-.005	.000	.003	.135	.026	.696	-.257	.006
INFECTION_8	.038	-.023	.013	.694	-.060	.089	-.036	.084
DW_9	.049	.009	.006	.079	.036	-.097	.701	-.172
DIRRV_10	.080	.024	.034	-.001	.023	-.096	-.583	-.434
CD_11	.932	.001	.004	.059	-.005	.020	.005	-.009
PLAY_12	.018	-.015	.907	-.027	-.007	-.035	.014	.000
RASH_13	.023	.093	-.034	.689	.111	-.008	.094	-.005
MPD_14	.921	.015	.003	.073	.018	.049	-.004	-.023
ANTIB_15	.013	-.068	-.049	.140	.824	.051	-.007	-.021
DPM_16	.908	-.009	.024	.042	.004	.014	.007	-.039
YOGA_17	.006	-.005	.903	.006	.032	.034	-.023	-.011
DIP_18	.816	.025	-.001	-.083	-.005	-.061	-.003	.047

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

the value 0.921, for pain relief do you prefer doctor prescribed medicine with value 0.908, discuss menstruation related issues with parents/friends/doctor with the value 0.816. The second component is heavily loaded by the factors- spotting during cycle with the value 0.939. Third component is heavily loaded by the factors - are you able to play and exercise with value 0.907, and do you practice yoga/exercise to avoid medicine with the value 0.903. Fourth component is heavily loaded by the factors- infection during cycle with the value 0.694, and do you get rashes/urinary tract infection with the value 0.689. Fifth component is heavily loaded by the factor- to avoid infection are you using anti bacterial/sanitizers/homemade remedies with the value 0.824. Sixth component is heavily loaded by the factors- back pain during cycle with the value 0.624 and weakness during cycle with the value 0.696. Seventh component is heavily loaded by the factor- are you able to do domestic work during cycle with the value 0.701 and eighth component is heavily loaded by the factor- abdominal pain during cycle with the value 0.851.

Looking at the analysis of the Table 8 (Fig. 9) we can interpret the component 1 as precautionary measures during menstrual cycle, the component 2 as spotting during cycle, the component 3 as preventions for health problems, the component 4 as possibilities of infection during cycle, the component 5 as remedies for infection, the component 6 as health problems during cycle, the component 7 as to be able to do domestic work during cycle and the component 8 as abdominal pain during cycle which are the major influencing health and precautionary variables for school going girls.

13 Conclusions

Health related practices and precautionary measures during the menstruation are of considerable importance as on account of its impact on health. In our study the factor analysis identified the most decisive

Fig. 8: **Table 7:** Component Transformation Matrix.

Component	1	2	3	4	5	6	7	8
1	.996	.046	.028	.061	.017	.019	-.002	-.022
2	-.044	.973	-.181	.034	.119	.042	-.001	.047
3	-.032	.180	.975	-.086	.059	-.034	-.019	-.054
4	-.055	-.040	.108	.839	.025	.377	.317	.190
5	.012	-.099	-.012	-.006	.752	-.411	.148	.484
6	-.009	-.077	.001	-.053	.375	.600	-.690	.122
7	-.001	-.044	-.043	-.328	.409	.453	.569	-.439
8	.039	.015	.039	-.416	-.329	.347	.280	.718

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

health factors which are spotting, infection, rashes or urinary tract infection, back pain, weakness and abdominal pain during the periods. Though the awareness about menstruation is not satisfactory [1] but they discuss their health problems and remedies related to menstruation with their parents, friends or doctors. It is also noted that majority of the girls prefers the medicines prescribed by the doctor and taking precautionary measures by performing yoga or exercise daily in order to stay healthy and be able to do domestic work. Many of them use sanitizers and homemade remedies to avoid infection.

Good hygiene practices such as the use of sanitary pads and adequate washing of the genital area are essential during menstruation. Adolescent school going girls need access to clean and soft absorbent sanitary pads which can, in the long run, protect their health. Along with the hygiene related practices during menstruation a simple modification in the life style by adopting the following measures can further help them to keep themselves healthy and fit during their periods:

- exercising 3 to 4 times each week.
- practising yoga every day.
- eating a well balanced diet that includes whole grain, vegetables and fruits, and decreasing salt, sugar, and alcohol intake.
- getting adequate sleep and rest.

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Fig. 9: **Table 8:** Factors loading values.

Components	Factors name	Factors loading value	Factors name
1	How many time do you consult the doctor?	0.932	Precautionary measures during menstrual cycle.
	Do you take the medicines prescribed by the doctor?	0.921	
	For pain relief do you prefer a medicine prescribed by the doctor?	0.908	
	Do you discuss menstruation related issues with your parents/ friends/ doctor?	0.816	
2	Do you have spotting during the cycle?	0.939	Spotting during cycle.
3	Are you able to play and exercise during your periods?	0.907	Preventions for health problems.
	Do you practice yoga/exercise to avoid medicine during menstruation?	0.903	
4	Do you suffer from infection during your periods?	0.694	Possibilities of infection during periods.
	Do you get rashes/urinary tract infection during your periods?	0.689	
5	To avoid infections during periods do you use antibacterial /sanitizers/ homemade remedies?	0.824	Remedies for infection during periods.
6	Do you feel weakness during menstruation?	0.696	Health problems during menstruation.
	Do you have back pain during your periods?	0.624	
7	Are you able to do domestic work during your periods?	0.701	Ability to do domestic work during periods.
8	Do you have abdominal pain during your periods?	0.851	Abdominal pain during menstruation.