

# MENSTRUAL BLOOD LOSS AND IRON NUTRITION IN FILIPINO WOMEN

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**Abstract.** Menstrual blood loss was measured in 80 apparently healthy women aged 15-44 years. The study showed a median menstrual blood loss of 37.1 ml per period and the range was from 5.4-169.0 ml. With an average menstrual cycle of 29 days and a mean hemoglobin content of 12.8 g/dl the average iron loss was estimated to be about 0.55 mg/day. The simultaneous effects of menstrual iron loss and dietary iron intake on the iron status of menstruating women were examined using multiple regression analysis. The parameters used to measure iron status were serum iron, transferrin saturation index (TSI), hemoglobin and mean corpuscular hemoglobin concentration (MCHC). Among these parameters, TSI was found to be the most sensitive indicator of changes in factors affecting iron balance. moreover, it was found that with greater menstrual loss and decreasing iron intake, there was a marked fall in TSI. However, the decline of TSI did not reach a level at which deficiency of iron transport would have occurred. These results suggest that iron intake was enough to replenish the iron lost in menstruation. Results of statistical analysis showed that the upper limit of menstrual blood loss should be about 80 ml per period. Any loss above this level for continuously long period of time may lead to anemia. This condition is further aggravated by insufficient iron intake. The data from this study are useful in estimating the recommended dietary allowance (RDA) for iron for menstruating Filipino women. They will also serve as a basis of management of patients in medical practice in terms of evaluating risk of and treatment of iron-deficiency anemia.

## INTRODUCTION

In nutrition and medicine, assessment of menstrual blood volume plays an important role in evaluating the possible effects of menstruation on the health of women (Davey, 1986; Fraser *et al*, 1985). To the practicing gynecologist, an objective measurement of menstrual blood loss is necessary because evaluation of menstrual bleeding based solely on the subject's estimate could be inaccurate (Selwood, 1978). Thus, in several studies (Hallberg and Nilsson 1964, Chimbira *et al*, 1980 and Fraser *et al*, 1984) a significant number of women who considered their menstrual blood loss as heavy (> 80 ml) were found actually to have "low" to "medium" losses (20-60 ml). On the other hand, some perceived their loss as minimal and yet their actual blood loss when measured was greater than the generally accepted normal upper limit of 80 ml (Hallberg *et al*, 1966).

Estimate of iron requirement is based primarily on three factors : (1) the amount needed for

growth, (2) the amount lost from the body, and (3) the bioavailability of the iron from the diet. For menstruating women aged 15-44 years who have already achieved the maximum potential for growth, iron loss and the amount absorbed from the diet remain as the two factors that determine the minimum iron requirement. The major and most variable determinant, however, has been shown to be the menstrual loss of iron (FAO/WHO, 1988; Wadsworth, 1970).

Several studies revealed that there was a definite decrease in hemoglobin concentration and a change in other parameters of iron nutriture when menstrual iron loss was high (Beaton *et al*, 1970). Hallberg *et al* (1966) and Cole *et al* (1972) also observed similar findings when menstrual blood loss exceeded 80 ml. However, in these studies, the dietary iron intake was not measured simultaneously with menstrual iron loss.

In contrast Davey (1986) reported that in some women despite the loss of excessive amounts of blood at menstruation (up to 300 ml) they still

maintain a normal hemoglobin level indicating that other factors such as the iron intake and the efficiency of the erythropoietic system to replenish blood loss may determine whether anemia would occur or not.

In this study both the effects of menstrual iron loss and iron intake on iron nutrition of menstruating women were investigated. Iron nutrition was assessed using serum iron, transferrin saturation index (TSI), mean corpuscular hemoglobin concentration (MCHC) and hemoglobin concentration as parameters. Also, in this study, we attempted to establish the level of menstrual blood loss that can be tolerated by Filipino women without adversely affecting iron balance. We are not aware of any similar previous study in the Philippines. Quantitation of menstrual blood loss data which heretofore has not been available is important in estimating the recommended dietary allowance (RDA) for iron in women.

## MATERIALS AND METHODS

A total of 80 apparently healthy women aged 15-44 years were recruited for the study. Subjects consisted of employees of the Food and Nutrition Research Institute (FNRI), students and some volunteers from a community in Singalong, Manila. Twenty subjects recruited belonged to the following age groups : 15-19; 20-29; 30-39 and 40-44 years. Fifteen years was chosen as the lower cut-off age because by this age menstruation has stabilized after the onset of menarche (Tindall, 1987a;b). Age 44 years was chosen as the upper limit for the last age group because the menopausal period usually starts between the ages of 45 and 50 years (Tindall, 1987a,b). In this study, women taking vitamins, iron supplements, any oral contraceptive agent (OCA) and using intra-uterine devices (IUD) were excluded (Cole *et al*, 1971; Shaw *et al*, 1980). Subjects were carefully instructed on how to collect their menstrual blood in two consecutive periods. At the start, they were asked to use sanitary napkins and tampons simultaneously in order to ensure complete blood collection. However, since all of them disliked using tampons, they were asked instead to change their pads more frequently to avoid saturating the napkin with blood. To ensure uniformity, only one brand of napkin established to have low blank

value for hematin was prescribed. Aside from napkins, stained tissue papers used during wash periods were collected in plastic containers which were collected after each period. Venous blood was extracted from the subjects. Those who had incomplete collection of pads were outrightly excluded.

Menstrual blood loss was determined using the method of Hallberg and Nilsson (1966). Although the method is time consuming and tedious, it has been reported to be sensitive and accurate (Shaw, 1977). In the procedure, the hemoglobin from menstrual blood was extracted and converted by treatment with 5% NaOH to alkaline hematin. The hematin was determined spectrophotometrically. Total menstrual blood was then calculated from the venous blood by the hemoglobin equivalent of the hematin. Hemoglobin was determined from the venous blood by the cyanomethemoglobin method (ICSH, 1978a,b). The amount of iron loss was then estimated from the hemoglobin loss, assuming that the iron content was 0.34 mg per g hemoglobin (Hallberg and Nilsson, 1964). Serum iron, TSI and MCHC were also determined by methods described previously (ICSH, 1978c; Lynch *et al*, 1969). To minimize the effect of diurnal and cyclic variation of serum iron, venous blood was extracted between 9-12 am on the 21st to the 23rd day after the onset of menstruation (Zilva and Patason, 1966).

Subjects also made a detailed record of their intake of food and drinks by using seven day food records in terms of household measures. They were advised to maintain their normal and usual eating habits since one of the aims of the study was to determine whether their usual dietary intake was adequate to meet the nutritional requirement for iron. Calculation of nutrient intake was done using the FNRI Food Composition Table (FCT) (FNRI, 1980). Mean dietary iron intake from the seven day food record of each subject was also calculated.

Medical history with emphasis on gynecologically related data, such as parity, weight and height, were asked from each subject and were recorded.

Statistical evaluation was done with an IBM-PC compatible computer using the Statistical Package for Social Sciences (SPSS). Logarithmic transformations for menstrual blood, iron

loss and serum iron were done since the values did not follow normal distributions. The values of biochemical parameters obtained from each of the two consecutive periods were averaged to derive a better estimate of the variables.

Multiple regression analysis was used to determine the simultaneous effects of menstrual iron loss and iron intake on the iron nutrition of menstruating women using as parameters : serum iron, TSI, hemoglobin and MCHC. Each multiple regression was tested for significance using analysis of variance. Correlation analysis was also used to determine the agreement between blood losses in two successive periods. Whether blood loss was correlated with parity, height and weight of the subject was also examined (Cole *et al*, 1971).

To establish the upper limit of tolerable menstrual blood loss without jeopardizing iron nutrition, the relationship between the different iron measurements and blood loss was studied. Menstrual blood loss values were arbitrarily grouped at regular intervals and the corresponding mean values of the various iron measurements at each range were then tested statistically using one way analysis of variance. Duncan's multiple range test was used to determine which range or amount of blood loss gave significant difference.

## RESULTS

### Characteristics of the subjects

The ages of the subjects ranged from 15-44 years. There was no significant difference between groups in terms of height. However, older females, especially the 40-44 years olds, were significantly heavier than the younger age groups (15-19 and 20-29 years). More than half of the subjects (60%) were nulliparous while only 12.5% had parity ranging from 4-8. The average length of menstrual cycle of the entire group was  $29.2 \pm 1.8$  days as determined from the subject's menstrual history.

In Table 1, the mean values of hemoglobin, MCHC and TSI and serum iron were comparable in the four age groups. Serum iron values were variable and had a high coefficient of variation of 41.3%.

### Menstrual losses

Table 2 presents the geometric mean, median

and ranges of menstrual blood loss by age group. The estimates showed an over-all geometric mean blood loss of  $37.1 \pm 2.0$  ml per period with a range varying from 5.4 – 169.0 ml.

Menstrual iron loss as estimated from menstrual blood loss is also given in Table 2. The iron loss in mg/day was obtained by dividing total iron loss per period of each subject by days of her menstrual cycle. The geometric mean iron loss for all the subjects was  $0.56 \pm 1.95$  mg/day while the median was 0.55 mg/day.

Although the younger age group (15-19 years) seemed to have a higher menstrual loss compared to the other age groups, analysis of variance revealed that age *per se* had no significant influence on the amount of menstrual blood flow ( $F = 0.94$ ).

Simple correlation tests also indicated that height, weight and parity had no significant relation to the amount of menstrual blood loss of the subjects ( $r = 0.04, 0.01, 0.10$ , respectively). For each particular subject, the correlation coefficient showed a high agreement between menstrual blood losses in two successive periods ( $r = 0.7$ ,  $p < 0.01$ ). This is consistent with previous reports (Hallberg *et al*, 1966; Beaton *et al*, 1970; Cole *et al*, 1972) indicating that although there is a wide variation of menstrual blood losses between subjects, there is a low variability in successive periods in the same subject.

### Dietary intake

Table 3 summarizes the dietary iron intake of the subjects by age groups as estimated from seven-day food records. Mean intake of other nutrients are also presented. The over-all mean dietary iron intake was 11.8 mg/day. Iron intake was derived from the following food sources in order of their decreasing percentage contributions : rice and cereal products (42.8%), meat, poultry and fish (37.6%), fruit and vegetables (11.2%), beans and nuts (5%), egg and milk (3.1%). Coffee and tea contributed the least : 1.2% iron.

### Effects of menstrual iron loss and dietary iron intake

Since it was found that menstrual blood loss was not affected by age, parity, weight and height, the 80 subjects were studied as a single group for evaluation of their iron nutrition.

Table 1  
Mean hematological values of subjects by age group.

Measurements	15-19 years $\bar{X} \pm SD$ (20)	20-29 years $\bar{X} \pm SD$ (20)	30-39 years $\bar{X} \pm SD$ (20)	40-44 years $\bar{X} \pm SD$ (20)	Total $\bar{X} \pm SD$ (80)
Hemoglobin (g/dl)	12.8 ± 0.9	12.9 ± 0.9	12.7 ± 0.8	12.7 ± 1.1	12.8 ± 0.9
MCHC (%)	33.5 ± 0.9	34.1 ± 0.7	33.8 ± 0.9	33.2 ± 1.1	33.7 ± 1.0
Serum iron* (mg/dl)	71.1 ± 1.6	123.9 ± 1.2	101.6 ± 1.6	67.6 ± 1.6	88.6 ± 1.1
Transferrin saturation index (%)	27.2 ± 8.0	27.9 ± 5.5	29.4 ± 7.3	27.1 ± 6.6	27.9 ± 6.8

\* - Geometric mean  
( ) - number of subjects

Table 2  
Mean, median and range of menstrual loss of subjects by age group.

Age (years)	15-19	20-29	30-39	40-44	Total
Blood loss (ml/period)					
Geometric mean ( $\bar{X} \pm SD$ )	44.1 ± 1.7	36.5 ± 1.7	38.7 ± 2.0	30.7 ± 2.4	37.2 ± 1.9
Median	44.0	41.1	37.2	34.8	38.0
Range	16.9 - 169.8	10.5 - 83.2	10.7 - 128.9	5.4 - 138.0	5.4 - 169.0
Iron Loss* (mg/day)					
Geometric mean ( $\bar{X} \pm SD$ )	0.64 ± 1.9	0.56 ± 1.75	0.57 ± 1.32	0.47 ± 2.39	0.55 ± 1.95
Median	0.61	0.58	0.54	0.54	0.56
Range	0.26 - 1.8	0.18 - 1.3	0.18 - 1.62	0.08 - 2.06	0.08 - 2.06

\* Iron loss(mg/day) =  $\frac{\text{Total iron loss per period}}{\text{Average menstrual cycle (days)}}$

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Table 3

Mean iron and other nutrient intake of subjects as estimated from seven day food record.

Nutrient	15-19 years	20-29 years	30-39 years	40-44 years	Total
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Iron (mg/day)	11.6 ± 2.4	10.7 ± 3.6	13.1 ± 5.3	11.9 ± 1.8	11.8 ± 3.6
Energy (kcal/day)	1708 ± 363	1576 ± 443	1631 ± 360	1641 ± 315	1638 ± 370
Protein (g/day)	61.0 ± 11.9	64.7 ± 17.7	73.9 ± 29.8	60.7 ± 11.7	65.2 ± 19.7
Vitamin C (mg/day)	29.6 ± 15	51.6 ± 41	52.2 ± 31	37.4 ± 21	42.7 ± 30

Table 4

Summary of multiple regression analysis of iron status on menstrual iron loss and iron intake of 80 subjects.

Dependent variables (y)	a (y intercept)	Regression coefficient (b)		R <sup>2</sup>	F
		Menstrual iron loss (x <sub>1</sub> )	Iron intake (x <sub>2</sub> )		
Serum iron (mg/dl)	95.7474	-22.499	1.475	0.25	0.26
Transferrin saturation index (%)	20.8457	- 5.3921**	0.4529*	0.43	8.61***
Hemoglobin (g/dl)	13.2330	- 0.3976	-0.01193	0.18	1.39
MCHC (%)	33.6573	- 0.3197	-0.02178	0.16	0.16

$$y = a + b_1 x_1 + b_2 x_2$$

\*\*\* - p < 0.001

\*\* - p < 0.01

\* - p < 0.05

F - Computed value for test of significance of multiple of regression

Table 4 presents a summary of the multiple regression analyses. Serum iron, TSI, hemoglobin and MCHC were treated as the dependent variables (y) which measure iron status; while menstrual iron loss ( $x_1$ ) and dietary iron intake ( $x_2$ ) were treated as the independent variables.

As shown in Table 4, TSI is the most sensitive indicator among the parameters examined. The coefficient of multiple determination ( $R^2 = 0.43$ ) was found to be highly significant ( $p < 0.001$ ). The simple correlation coefficient between menstrual iron loss and TSI showed a significant inverse relationship ( $r = -0.34, p < 0.01$ , data not shown) indicating that TSI tended to decrease as menstrual iron loss increased. Likewise, dietary iron intake estimated from the 7-day food record correlated significantly with TSI. The positive correlation ( $r = 0.30, p < 0.05$ ) indicates that high dietary intake of iron increases TSI values. On the other hand, serum iron, MCHC and hemoglobin were not significantly correlated with either the menstrual iron loss or iron intake.

Regarding hemoglobin level, individual data suggest that with greater menstrual iron losses, there was a decrease in hemoglobin values. To firmly establish this relationship, a regression analysis was done between hemoglobin and menstrual iron loss in subjects with losses greater than 0.6 mg iron day. The negative regression coefficient became significant ( $b = -26, p < 0.05$ , data not

shown). Although Beaton *et al* (1970) considered dietary iron intake  $< 11.0$  mg/day as a critical value for significant reduction in hemoglobin level, this was not established in this study since few subjects had an intake below the aforementioned value.

#### Upper limit of menstrual blood losses

Among the various parameters that were examined, the mean values of TSI and hemoglobin were significantly decreased ( $p < 0.05$ ) especially when menstrual blood loss was greater than 80 ml. As shown in Table 5, the mean TSI and hemoglobin values were  $21.5 \pm 8.8\%$  and  $11.9 \pm 0.92$  g/dl, respectively, when blood loss was more than 80 ml, in contrast to the mean levels of  $29.0 \pm 4.6\%$  for TSI and  $13.2 \pm 0.8$  g/dl for hemoglobin when blood loss was only 20 ml or less. A decrease in the MCHC values was also noted when menstrual blood loss exceeded 80 ml.

Although the effect on serum iron was not significant, it was clear that with a menstrual blood loss  $> 80$  ml per period, the mean serum iron level was  $71.5 \pm 1.7$  mg/dl, whereas when blood loss was minimal (1-20 ml) the mean serum iron level was high ( $96.8 \pm 1.5$  mg/dl).

The arbitrary cut-off level of 80 ml as an appropriate upper limit above which iron deficiency may occur was further verified by subjecting this

Table 5

Relation of menstrual blood loss to iron parameters.

Range of blood loss (ml/period)	No. of subjects	Hemoglobin (g/dl) $\bar{X} \pm SD$	MCHC (%) $\bar{X} \pm SD$	Serum Iron** (mg/dl) $X \pm SD$	TSI (%) $\bar{X} \pm SD$
1-20	17	$13.2^* \pm 0.8$	$34.0 \pm 0.9$	$96.8 \pm 1.5$	$29.0^* \pm 4.6$
21-40	25	$12.8 \pm 0.9$	$33.5 \pm 0.9$	$96.7 \pm 1.5$	$29.6^* \pm 5.7$
41-60	18	$12.6 \pm 1.0$	$33.8 \pm 1.1$	$91.7 \pm 1.6$	$29.3^* \pm 7.4$
61-80	11	$13.2^* \pm 0.7$	$33.8 \pm 0.9$	$78.8 \pm 1.5$	$24.77 \pm 6.5$
$> 80$	9	$11.9 \pm 0.9$	$33.1 \pm 0.7$	$71.5 \pm 1.7$	$21.5 \pm 8.8$
Total	80	$12.8 \pm 0.9$	$33.7 \pm 0.9$	$90.2 \pm 1.6$	$27.8 \pm 6.5$

\* - indicates that the value is significantly higher from the value when blood loss is  $> 80$  ml ( $p < 0.05$ )

\*\* - Geometric mean

Table 6

Coefficient of regression of hemoglobin and transferrin saturation index (TSI) above and below the arbitrary cut-off level of 80 ml.

Menstrual blood loss (ml)	No. of subjects	Hemoglobin		TSI	
		b	r	b	r
≤ 80 ml	71	0.0004	0.01	0.05	-0.15
> 80 ml	9	0.09	-0.60	-0.25*	-0.80*

\* -  $p < 0.01$   
 b - slope  
 r - correlation coefficient

to two separate regression analyses of data partitioned at two levels : above and below 80 ml.

As shown in Table 6, the regression coefficient between TBI and menstrual blood loss became more increasingly negative, highly significant ( $r = -0.80$   $p < 0.01$ ), when the loss exceeded 80 ml than when the loss was equal to or less than 80 ml ( $r = -0.15$ , NS). Fig 1 illustrates the two regression lines. Compared to the regression obtained from the whole range (line 1), there was a steeper slope (line 3) when menstrual blood loss was greater than 80 ml (line 2). These findings suggest that TSI may decrease at a significant rate when menstrual blood loss becomes  $> 80$  ml. Blood loss less than 80 ml would have no discernible effect on iron parameters.

Two subjects in this study with actual menstrual blood loss of more than 100 ml per period

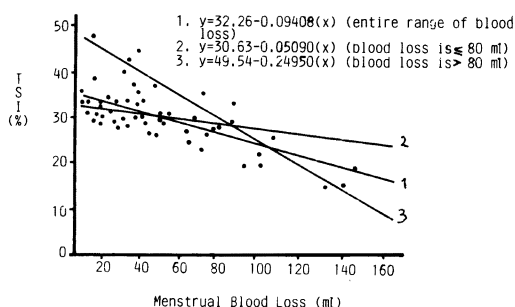


Fig 1—Regression of Transferrin saturation index on menstrual blood loss.

had subnormal levels of serum iron (53.3 mg/dl), TSI (10%) and increased total iron binding capacity or TIBC (455 mg/dl), highly suggestive of iron deficiency.

The regression coefficient of menstrual blood loss greater than 80 ml on hemoglobin level showed a negative relationship; however, this was not significant.

### DISCUSSION

The speculation that excessive iron loss from menstruation could lead to iron deficiency anemia had been demonstrated in several studies (Beaton *et al*, 1970; Cole *et al*, 1972; Shaw *et al*, 1980). Hallberg *et al* (1966) showed this in a large population study. Although it was mentioned that the study population had an average iron intake of 10.2 mg/day, simultaneous effects of both iron intake and menstrual iron loss on iron status were not examined.

Beaton *et al* (1970), on the other hand, investigated the combined effects of the two variables affecting iron status in 85 healthy, free living Canadian women including those who were taking oral contraceptives. Although he was able to show a significant inverse relationship between serum iron and menstrual iron loss in subjects of low dietary iron intake ( $\leq 10.6$  mg iron/day), the independent effects of oral contraceptives—namely, to elevate serum iron level and decrease menstrual blood loss (Cole *et al*, 1971) — which were not controlled could have caused bias in the analyses. Nevertheless, Beaton *et al* (1970) suggested that with a dietary pattern comparable to their subjects, a daily iron intake of about 11.0 mg/day may be sufficient to prevent iron depletion.

Using regression analysis, the data from this study demonstrated that TSI is a more sensitive indicator than serum iron, MCHC and hemoglobin, of changes in factors affecting iron balance, such as menstrual iron loss and dietary iron intake. The development of iron deficiency proceeds in three stages. The first stage consists of a depletion of storage iron detected by determination of serum ferritin concentration. The second stage consists of a decrease in transport iron, which is characterized by an increase in the iron-binding capacity in addition to a decrease in levels of serum iron.

These changes are best reflected by TSI which is calculated from the ratio of the two values. During the third stage, hemoglobin production diminishes (Dallman, 1981).

There was a highly significant inverse relationship between the two factors and TSI suggesting that the combined effects of greater menstrual loss and decreasing iron intake can cause a marked fall in TSI. However, except for the two subjects described earlier, the decline of TSI did not reach a level at which deficiency of iron transport started to become manifest (less than 16%) (INACG, 1985). On the other hand, dietary iron in our study was found to have a significant positive correlation with TSI implying that iron intake was able to meet the iron required to replace menstrual iron loss. However, the net effect of menstrual blood loss on iron storage at this level of iron intake could not be determined since serum ferritin was not examined in this study. This study revealed an average iron intake of 11.8 mg/day for all the subjects which was higher than the cut-off value suggested by Beaton *et al* (1970).

To establish a critical level of menstrual blood loss above which hematological impairment occurs is difficult. Hallberg *et al* (1966) suggested that losses exceeding 80 ml per period can cause a definite decrease in hemoglobin and serum iron concentration. Cole *et al* (1972), on the other hand, reported that even at lower losses, a corresponding decrease could take place.

Our data appear to support Hallberg's findings. In our study it was shown that there was a significant negative relationship between TSI and menstrual blood loss greater than 80 ml.

If we calculate the amount of iron loss in 80 ml menstrual blood based on the mean hemoglobin content of 12.8 g/dl and spread this throughout the 29-day menstrual cycle, the iron loss would be about 1.21 mg/day. Adding this amount to the median basal iron loss of 0.77 mg/day for menstruating women (FAO/WHO, 1988), a 49 kg Filipino woman will need a daily iron intake of 25 mg/day to keep her in iron balance. This is based on the assumption that absorption rate of iron from a typical Filipino meal is 8.2% (RDA Committee, 1989).

This rough estimate of daily iron intake is consistent with the 1989 recommended dietary iron

allowance for menstruating Filipino women which is 25-26 mg/day (RDA Committee, 1989). Thus, the suggested upper normal limit of 80 ml menstrual blood loss may be regarded as a fairly good estimate. One may observe, however, that in spite of the similarity obtained for the limit of menstrual blood loss with that of Hallberg *et al* (1966), the recommended basal iron requirement for Filipino menstruating women is high. The difference is due largely to a low bioavailability of iron from local diets (RDA Committee, 1989).

In conformity with the results of other authors (Hallberg *et al*, 1966; Beaton *et al*, 1970; Cole *et al*, 1971) the variation of menstrual blood loss found in this study was due to the wide range of losses between subjects and not between periods in the same subject. In clinical practice, information such as this is crucial to the management of the women since excessive menstrual blood loss can cause iron deficiency anemia. This also has an important implication when interpreting results of studies such as the effect of drugs or gynecological operations on menstrual blood loss (Hallberg and Nilsson, 1964). Fraser *et al* (1985) emphasized that objective measurement of menstrual blood loss, although tedious for routine use is the only practical way in which menorrhagia can be unequivocally established.

Our data cannot explain the wide variations in menstrual blood loss observed. Menstrual loss was not correlated with age, body weight and height. Cole *et al* (1971) reported a significant rise in menstrual blood loss with increasing parity, but this could not be demonstrated in our study probably because 60% of the subjects were nulliparous.

Results showed geometric mean blood loss of  $37.2 \pm 2.0$  ml per period was comparable to  $38.5 \pm 2.0$  ml obtained by Hallberg *et al* (1966) in subjects with normal menstruation. Although not statistically significant, the younger age group 15-19 years in our study had a greater average menstrual blood loss than the other age groups. This is in contrast to the finding of Hallberg *et al* (1966) which showed that older age group (40 years and above) had higher menstrual losses than those below 20 years. Whether this increased blood loss in Filipino adolescents was physiological or not could not be ascertained in this study. It is enough to state that based on some reports,



dysfunctional uterine bleeding (DUB) in women under 20 years of age may persist in as many as the first 30-40 cycles after menarche, and this may be considered as normal part of puberty (Davey, 1986; Fraser *et al*, 1985). In Filipino adolescents, however, this remains to be thoroughly investigated.

#### SUMMARY AND CONCLUSION

A study on the simultaneous effects of menstrual iron loss and dietary iron intake on the iron nutrition status in 80 women showed that exceptionally high menstrual iron loss with marginal iron intake can lead to iron deficiency. Although dietary iron intake was found to have a compensatory effect on the iron losses in menstruation, this will not hold true when a persistently low dietary iron intake has been taking place over a protracted period of time. Furthermore, this study also showed that TSI, among the four parameters, is the most sensitive indicator of changes in factors affecting iron balance.

The findings of this study were consistent with the results of a population study undertaken by Hallberg *et al* (1966). Based on the iron intakes of the subjects, maximum allowable menstrual blood loss should be about 80 ml per period. Cumulative loss over and above this level will eventually lead to iron depletion if not adequately compensated with increased iron intake. Adequate intake of iron is important for the following reasons: (1) it improves the physical and mental performance and (2) it promotes storage of adequate iron in mothers for normal development of babies *in utero*.

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