INTRODUCTION:
Puberty is a complex interplay of hormonal and physiological changes that result in sexual maturation and capability for reproduction. This transition from childhood to adulthood can be difficult for few adolescents, puberty menorrhagia (Adolescent AUB) is one of such problems.

Puberty menorrhagia is defined as excessive bleeding in quantity (>80ml) or duration (>7days) between menarche and 19 years of age. Menarche is one of the life turning events for an adolescent girl. Mechanisms triggering puberty and menarche are dependent on genetics, nutrition, body weight and maturation of the hypothalamo-pituitary-ovarian (HPO) axis. Adolescents present with complaints of menstrual irregularities frequently nowadays. Abnormal bleeding accounts for almost 50% of gynecological visits varying from minimal spotting to severe bleeding. In 80% of cases of puberty menorrhagia, anovulation is the cause. Hypothalamic immaturity and inadequate positive feedback results in sustained high levels of estrogen resulting in breakthrough bleeding. After exclusion of pregnancy, abnormal bleeding in adolescents may be due to endocrine, hematological, anatomical and iatrogenic causes. Most of the cases can be managed medically, surgical intervention is rarely required. Abnormal bleeding and a period of regular menstruation has better prognosis than the one with its onset at menarche. Adolescents with gynecological problems require reassurance, sensitive handling and advice regarding diet and lifestyle modification.

MATERIALS AND METHODS:
This study evaluates 77 cases of severe puberty menorrhagia managed by in hospital admission at Sri Dharmasthala Manjunatheshwara College of Medical Sciences and Hospital, Dharwad, India from 2007 to 2017. Data was collected from Medical Records Department using a predesigned proforma and analyzed. It was a retrospective analytical study and no interventional procedures were undertaken. The study was approved by the ethical committee of the college.

INCLUSION CRITERIA INCLUDED:-
1) Persistence of bleeding >7 days
2) Increased flow associated with clots
3) Hemoglobin <10g/dl / signs & symptoms of anaemia with or without features of failure
4) History of previous hospitalization and transfusion of blood products
5) Urine pregnancy test negative

Detailed history regarding age at admission, age of menarche, pubertal development, menstrual history regarding the amount of blood loss and duration of symptoms were noted. Medical history of recent weight gain/loss, tuberculosis, endocrine diseases such as thyroid disorder, any renal, cardiac, hematologic disorder, bleeding diathesis, drug intake, previous history of blood transfusion and any surgeries done was recorded. Family history of tuberculosis, thyroid disorder and bleeding disorders taken. Personal history including sexual behavior was noted.

Detailed clinical examination included general physical examination, vitals, secondary sexual characteristics, stigmata of Polycystic Ovarian Syndrome (PCOS), hirsutism and significant findings on systemic examination were noted. A bimanual per-rectal examination was performed for all patients. Per speculum and per vaginal examination was done during examination under anesthesia (EUA) in specific cases when indicated.

Initially routine investigations done were complete hemogram, hormonal profile, blood group & type, coagulation profile and pelvic ultrasound. Further based on these reports specific investigations were done. In severe anemia-red blood cell (RBC) indices, reticulocyte count, indirect Coomb’s test, direct Coomb’s test, liver function test, renal function test, peripheral smear for malarial parasite and bone marrow examination were analysed. In deranged coagulation profile, clotting factor assays, fibrinogen levels, platelet function tests and Von Willebrand specific assays were ordered. In suspected Koch’s, Mantoux test and chest radiograph, collected menstrual blood or endometrial biopsy for acid fast bacilli and histopathology were performed.

All patients received hormonal therapy alone or in combination with antiinflammatory as first line of treatment. Based on the etiological factors, additional specific treatment was given. All cases with severe anemia and coagulation disorders received blood / blood products transfusion. Cases with acute severe blood loss going in for shock required surgical intervention.

RESULTS:
A total of 77 patients with puberty menorrhagia were analyzed retrospectively. Of these 77 patients attained menarche between 12-13 years (42.85%), 21 patients between 11-12 years (27.27%), 16 patients were more than 13years (20.77%) and 7 patients were less than 11 years (9.09%) of age(Table 1).

Table 1: Age at menarche of cases

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Total number of cases</th>
<th>Percentage of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11</td>
<td>7</td>
<td>9.09</td>
</tr>
<tr>
<td>11-12</td>
<td>21</td>
<td>27.27</td>
</tr>
<tr>
<td>12-13</td>
<td>33</td>
<td>42.85</td>
</tr>
<tr>
<td>&gt;13</td>
<td>16</td>
<td>20.77</td>
</tr>
</tbody>
</table>

ABSTRACT
To study the prevalence, etiology and management of Adolescent AUB.

KEYWORDS : Adolescent, heavy menstrual bleeding, hormonal therapy.
Mean duration from onset of menarche to presentation with AUB was
- at AOM (at onset of menarche) 16 patients, 18 patients with in 1 year
- of menarche, 23 patients between 1 to 3 years of menarche and 20
- patients beyond 3 years of menarche. 46.87% of patients had duration
- of symptoms less than 6 months, 31.25% had symptoms for more than
- one year. Of the patients presenting at AOM 13 cases had coagulation
- disorder (Table 2).

### Table 2: Duration in years since menarche

<table>
<thead>
<tr>
<th>Time of presentation</th>
<th>No. of cases</th>
<th>Patients with hematomal disorders</th>
<th>Percentage(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>At AOM</td>
<td>16</td>
<td>13</td>
<td>81.2</td>
</tr>
<tr>
<td>&lt;1yr</td>
<td>18</td>
<td>2</td>
<td>12.5</td>
</tr>
<tr>
<td>1-3yrs</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;3yrs</td>
<td>20</td>
<td>1</td>
<td>6.25</td>
</tr>
</tbody>
</table>

AOM - at onset of menarche

Of the 77 cases, 32.46% of patients were underweight, 10.38% were
- overweight, and 57.14% were in normal weight category (Table 3).

### Table 3: BMI of patients

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>No of cases</th>
<th>Percentage(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>25</td>
<td>32.46</td>
</tr>
<tr>
<td>18.5-23</td>
<td>44</td>
<td>57.14</td>
</tr>
<tr>
<td>&gt;23</td>
<td>8</td>
<td>10.38</td>
</tr>
</tbody>
</table>

AUB resulted in severe anemia in 55 cases. Hemoglobin level less
- than 7g/dl was noted in 24 patients (31.16%) and level 5-7g/dl was seen
- in 31 patients (40.25%). All the patients with hemoglobin less than 7g/dl
- received blood transfusion (Table 4).

### Table 4: Hemoglobin levels of patients

<table>
<thead>
<tr>
<th>Hemoglobin(g/dl)</th>
<th>No of cases</th>
<th>Percentage(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>24</td>
<td>31.16</td>
</tr>
<tr>
<td>5-7</td>
<td>31</td>
<td>40.25</td>
</tr>
<tr>
<td>7-10</td>
<td>17</td>
<td>22.07</td>
</tr>
<tr>
<td>&gt;10</td>
<td>5</td>
<td>6.49</td>
</tr>
</tbody>
</table>

Majority of the cases were due to endocrine causes (71.42%), of which
- anovulatory AUB constituted 40 (51.95%) patients. PCOS was
diagnosed in 10 patients based on ultrasound findings and /or features
of hyperandrogenism. Overt hypothyroidism was diagnosed in 4 patients and 1 patient had hypothyroidism with high prolactin levels.
Coagulation abnormalities were seen in 16 patients, 11 of them had
- congenital coagulation disorders and whereas 5 had acquired causes.
Fibroid uterus was seen in 4 patients and bicornuate uterus in 1 patient
- which resulted in AUB. One patient was on anticoagulant therapy for
- congenital coagulation disorders and whereas 5 had acquired causes.
Coagulation abnormalities were seen in 16 patients, 11 of them had
- hypothyroidism and hyperprolactinaemia. Coagulation
- disorders include, platelet disorders (eg.Glanzmann’s Thrombas-
- sis, infection and sarcoma botryoides.Endocrine causes are
- comprised of cervicitis, condyloma, sarcoma botryoides, polyp
- and fibroids. Ovarian causes are immature hypothalamic pituitary
- ovary axis, PCOS and estrogen producing tumors. Cervical causes
- comprise of cervicitis, condyloma, sarcoma botryoides, polyp
- and malignancy. Vulvo-vaginal causes consist of trauma, foreign body,
- vaginitis, infection and sarcoma botryoides.Endocrine causes are
- commonly hypothyroidism and hyperprolactinaemia. Coagulation
- disorders include, platelet disorders (eg.Glanzmann’s Thrombasa-
- thenia) Von willebrand disease, other clotting factor deficiencies,
- drugs and acquired causes.1

A total of 55 patients required blood transfusion (71.42%). ICU
admission was required for 6 (28.75%) patients, who needed inotrope
support. Additional surgical intervention was done in 6 cases (Table 7).
Dilatation and curettage was done for thickened endometrium of
3.5cms, not responding to progesterone therapy. Hysteroscopic
myomectomy was performed for a submucous fibroid polyp and
laparotomy was done for hemoperitoneum resulting from ruptured
corpus luteal cyst.

### Table 7: Surgical treatment

<table>
<thead>
<tr>
<th>Procedure done</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUA + Dilation and curettage</td>
<td>1</td>
</tr>
<tr>
<td>EUA + Hysteroscopic myomectomy</td>
<td>1</td>
</tr>
<tr>
<td>Laparotomy for hemoperitoneum</td>
<td>2</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>1</td>
</tr>
</tbody>
</table>

Discussion:
Common Causes of abnormal uterine bleeding include:-Uterine
causes like pregnancy, endometritis, hyperplasia, malignancy, polyp
and fibroids. Ovarian causes are immature hypothalamic pituitary
ovarian axis, PCOS and estrogen producing tumors. Cervical causes
comprise of cervicitis, condyloma, sarcoma botryoides, polyp
and malignancy. Vulvo-vaginal causes consist of trauma, foreign body,
vaginitis, infection and sarcoma botryoides.Endocrine causes are
commonly hypothyroidism and hyperprolactinaemia. Coagulation
disorders include, platelet disorders (eg.Glanzmann’s Thrombas-
thesia) Von willebrands disease, other clotting factor deficiencies,
drugs and acquired causes.1

In the present study,51.94% of cases of puberty menorrhagia the cause
was found to be anovulatory dysfunctional uterine bleeding which is
less than reported by Roy Chowdhury (61.5%) and Chaudhary et al.
(71%) 1. Koranne et al reported 80% of cases of puberty menorrhagia
due to the same cause. Initially due to immaturity of the HPO axis,
the continuous rise in estrogen stimulates endometrial growth. This
ultimately outgrows its blood supply and architectural support,
resulting in partial breakdown and shedding in an irregular manner. In
anovulatory AUB the lack of progesterone results in decrease in the
PGE2a:PGE2 ratio and relative increase in the vasodilator and
antiplatelet-aggregatory PGE2 which accounts for the increased mean
menstrual blood loss.4

In our series of patients, majority were managed medically to control
the acute phase of bleeding. Rao reported the requirement of blood transfusion to be 37.8% in treating cases of pubertal menorrhagia. In our study the need for blood transfusion was 71.42%. Roy Chowdhury reported the requirement for blood transfusion to be 35%.

Treatment in anovulatory DUB was directed towards stabilizing the endometrium and treating the hormonal alterations. It includes first of all reassurance that it is a self-limiting problem. Though Tranexamic acid and Mefenamic acid help in reducing the bleeding in mild cases treated on outpatient basis actual control and stoppage of severe bleeding needing admission is achieved by high doses of progestogens (medical curettage), which are then tapered to give a bleed free interval. In severe cases addition of estrogen therapy is required. In our study progestogens and tranexamic acid alone or in combination with other drugs were used in all patients. Subsequently Progestogens can be used cyclically in 2 different treatment protocols as a short course during the luteal phase and a relatively longer course of 21 days from fifth day of the cycle. Progestogens can also be used in combination with estrogen as COCP’s or with androgens (but long term treatment is not acceptable due to undesirable side effects).

In our study menorrhagia due to PCOS was 12.98% which was more compared to other studies. There is striking increase in incidence of PCOS, causes for which are multifactorial. Diagnosis was confirmed by biochemical or clinical hyperandrogenism, oligo-anovulation and polycystic ovarian morphology (PCOM) on ultrasonography. In immediate post menarche one or more of these features can be physiological, hence diagnosis of PCOS is made only after 2 yrs of AOM unless there is biochemical evidence of hyperandrogenism.

Combined hormonal pills are best line of treatment for PCOS (pills with drospirenone or cyproterone acetate, depending on individual requirements) along with life style changes, dietary modification, weight reduction and improving metabolic status.

Hypothyroidism is associated with menorrhagia either due to breakthrough bleeding, associated hypocoaagulable & hyperlipolytic state. The intrinsic clotting mechanism may be defective because of decreased concentrations in plasma of factors VIII and IX, and this, together with an increase in capillary fragility and the decrease in platelet adhesiveness, may account for the bleeding tendency that sometimes occurs.

In our study 6.49% patients were hypothyroid as opposed to 5.7% Koranne et al and 7.15% Mukherjee et al.

Menorrhagia due to coagulation disorders (CD) were 20.77% in our study. The most common coagulation disorders that cause adolescent AUB are platelet disorders followed by clotting factor deficiencies. Others include associated systemic diseases, infections, leukemias and drug induced. Most of the hereditary conditions are diagnosed in early childhood but in some menorrhagia may be the first presenting symptom.

In our study 81% of cases with CD presented at AOM, 5 patients needed ICU admission, most of them required blood/blood products transfusion, had multiple admissions, 2 underwent laparotomy for hemoperitoneum and two underwent prophylactic hysterectomy after completion of family. Such is the morbidity caused hence all cases of severe puberty menorrhagia should be evaluated for CD.

Conclusion:
Adolescent AUB results in anemia, school absenteeism, hospitalization, morbidity, expenditure and has a long term sequel on nutritional, psychological and academic status of the affected girl. Hence individualization of every case, thorough evaluation, timely hospitalization and/or referral, and appropriate treatment are crucial in their management and avoidance of iatrogenic/non iatrogenic complications. Reassurance, counselling about reproductive physiology, regular follow-up, balanced diet and iron therapy go a long way in treatment of adolescent AUB.

REFERENCES