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Original Article

Non-Pneumatic Anti Shock Garment (NASG) in Post Partum Haemorrhage-Our Experience

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ABSTRACT

Introduction: Non-pneumatic Anti-Shock Garment (NASG) is a unique, Life -saving, first -aid device made of neoprene and Velcro, which is used on women with obstetric haemorrhage. The NASG has a unique role in haemorrhage and shock management because, it is meant to be used with, not instead of, other technologies. Currently, it is the only tool that aids in stabilizing pulse and blood pressure after a woman has gone into shock from obstetric haemorrhage. **Aims And Objectives**: To study sociodemographic profile, stage of shock, different types of Post Partum Haemorrhage, safety, and efficacy of Non pneumatic Anti Shock Garment. **Methodology**: A Prospective observational study was conducted in department of Obstetrics and Gynaecology in Government medical college, Aurangabad, Maharashtra. Detail history, demographics characteristics, aetiology or risk factors, maternal complication were recorded and analysed. Primary data was collected in paper based proforma and the data was then entered in Microsoft Excel spreadsheets. Statistical analysis was done tests. **Results**: The mean age of the woman was 24.32. 44% women were from urban area and 56%were from rural area. 29(58%) women were having secondary education. Around 74% women belonged to lower middle class. 52% women were unbooked and 48%were booked cases. The women unemployed were accounting for 56%. 68% were multipara with Abruptio placenta being the most common risk factor in 18%. Atonicity was seen in 62%women of PPH, and majority of the women were applied NASG in stage 2 (54%). There was significant improvement in the pulse rate, Systolic Blood Pressure, Diastolic Blood Pressure and Mean Arterial Pressure after application of NASG and hence proved to be efficacious. Only 1woman had died with PPH being the immediate cause of death. NASG was applied in 94% women for 12-24 hrs. The shock index improved drastically after NASG application. Moreover, NASG use was not associated with any side effects and hence was considered safe. **Conclusion**: The use of NASG as an adjunct to main treatment was found to be very efficacious in reversing life-threatening haemorrhagic shock, and is found to be a cost effective, reusable and a viable tool with no major side effects and discomfort in reducing the maternal mortality in all cases of PPH.

Key Words: *NASG, Shock Index, Haemorrhage, Atonic PPH.*

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INTRODUCTION:

Maternal mortality is a public health indicator related to social development and health equity around the world and one of the main indicators for monitoring the progress toward the Millennium Development Goal 5 (MDG-5)[1]. As per the latest report of sample registration system (SRS) released by Registrar general of India (RGI), maternal mortality ratio of India per 100,000 live births has declined to 97 in 2018-20 from 103 in 2017-19 and 113 in 2016-18. The MMR of Maharashtra has declined to 33 in 2018-20 from 38 in 2017-19. Most of these deaths are avoidable and take place in low-income countries.

Postpartum haemorrhage (PPH**)** is a leading cause of these deaths and is defined as a condition of maternal active genital bleeding after delivery, with at least one of the following: perceived abnormal bleeding (500 mL or more) or any bleeding with hypotension or blood transfusion[2]. Haemorrhagic shock is a rare but serious complication, which may occur in many obstetrical situations[3]. Death and morbidity secondary to haemorrhage are becoming less common due to early recognition and intervention and improved availability of medical resources. Obstetrical haemorrhage is often acute, dramatic, and underestimated. Postpartum haemorrhage is a significant cause of maternal death[3].

In all women, Shock Index (SI), the ratio between the heart rate and the systolic blood pressure, is measured at the time of diagnosis[4]. SI has been studied in the obstetric population as a valuable marker of hemodynamic instability in cases of massive PPH and has been found to be directly related to the probability of massive transfusion and the

development of coagulopathy[4]. Maternal death surveillance review (MDSR) indicates that PPH is one of the major causes of death in our institute. The incidence of PPH in our institute accounts for 1.26% of the total deliveries noted over period of last two to three years and PPH accounts for 15% of the maternal deaths in our institute. Hence it is necessary to reduce the high rate of deaths due to PPH and therefore it is justifiable to use something which is easily available, which is of low cost, reusable, which can be applied by even a non-medical person, which does not require any special training[5].

To study this in a peripheral place like our tertiary care facility, where there are bad referrals, NASG is an aid which may be helpful in such situations[6]. Not only PPH, but it can also be used in other haemorrhagic shocks which occur in obstetrics like ruptured ectopic pregnancy[7]. Hence, this study was conducted considering the large cases of PPH in this institute to save maternal lives.

AIMS & OBJECTIVES:

1. To study the sociodemographic profile of the patient coming with PPH.
2. To identify the stage of shock at the time of application of NASG.
3. To study the different types of post-partum haemorrhage
4. To study the safety and efficacy of NASG application.

MATERIAL AND METHODS:

Present study was a prospective, observational study conducted at Department of Obstetrics and Gynaecology, at our tertiary care centre. After obtaining the permission from the institutional ethics committee and after applying the inclusion and exclusion criteria those women who were willing to participate in the study were selected for the study.

Inclusion Criteria:

i. All women delivering at the institution having PPH.
ii. All women who delivered outside this hospital had PPH and then referred to our institute.
iii. Patient willing to participate in the study.

Exclusion Criteria were: Patient not willing to participate in the study.

Written valid informed consent was taken for participation in this study from the patient (if patients general condition allows) or from the relative (attendant) accompanying the patient. Detailed history was taken at the time of admission. General physical examination, systemic and obstetric examination was carried out. Investigations like complete blood count with absolute platelet count, liver function tests, renal function tests, coagulation profile, urine examination with urine routine microscopy and urine albumin was performed for all patients. Data was documented in case Proforma, and data collection sheets were prepared. Statistical analysis was done on IBM SPSS STATISTICS VERSION 22. Categorical data represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test (for 2x2 tables only) used as test of significance for qualitative data.MS Excel and MS word used to obtain various types of graphs. P value of <0.05 considered as statistically significant after assuming all the rules of statistical.

NASG was applied by the doctor on emergency duty, whenever patient was reported to have haemorrhagic shock. As soon as shock was recognised in the hospital, the shock index was calculated, and anti-shock garment was placed. Pulse rate, Systolic blood pressure, diastolic blood pressure, mean arterial pressure, Shock index, were measured before application, after 30 mins, after 1 hr of application and at the time of removal of NASG to test the efficacy of NASG. Simultaneously supportive care was given. Side effects of NASG if any like nausea, vomiting, respiratory difficulty, and abdominal pain were noted to test for safety of NASG.

Shock was classified based on the shock index and appropriate management was given. Blood and blood products were given. Vital signs were monitored every 15 to 30 minutes, hourly urine output and intermittent oxygen saturation was used to monitor patients during the use of the anti-shock garment. Monitoring of the patient was done for every 15 mins in first 1 hour and there after every 30 mins in next 2 hrs followed by hourly monitoring. NASG was removed step by step as per protocol when Patient was stable for 2 hours, Bleeding < 50 ml/hr Pulse < 100 / min, Systolic BP 90-100 mm Hg, Shock index 0.5-0.7 &Patient was conscious & aware.

RESULTS

The total number of cases studied were 50 women.

Table No 1: Distribution On the Basis of Sociodemographic Variables.

PARAMETERS	FREQUENCY	PERCENTAGE
AGE		
<20 yrs.	10	20%
21-25 yrs.	22	44%
26-29 yrs.	12	24%

>30 yrs.	6	12%
RESIDENCE		
Urban	16	32%
Rural	34	68%
EDUCATION		
Primary	1	2%
Secondary	29	58%
Higher secondary	18	36%
Graduation	2	4%
Post-Graduation	0	0%
SOCIOECONOMIC CLASS (KUPPUSWAMY)		
Class 1 (upper)	2	4%
Class 2 (upper middle)	9	18%
Class 3 (lower middle)	37	74%
Class 5 (lower)	3	6%
ANC REGISTRATION STATUS		
BOOKED	24	48%
UNBOOKED	26	52%

Table 1: Shows the sociodemographic data of the 50 women enrolled in the study. The mean age was 24.32 yrs. Majority of the PPH occurred in women residing in rural area with secondary level of education, belonging to lower middle class socioeconomic status with unbooked ANC registration status.

Table No 2: Distribution Based on Parity, Mode of Delivery, Type and Stage of PPH.

PARAMETERS	FREQUENCY	PERCENTAGE
PARITY		
Primipara	14	28 %
Multipara	34	68%
Grand Multipara	2	4%
MODE OF DELIVERY		
Vaginal	37	74%
C- Section	13	26%
TYPE OF PPH		
Atonic PPH	31	62%
Mixed PPH	10	20%
Tissue PPH	6	12%
Traumatic PPH	3	6%
STAGE OF SHOCK		
Stage 2	27	54%
Stage 3	23	46%

Table 2: Shows out of 50 women, 34 (68%) women were multipara, delivered vaginally (74%) were applied NASG in stage 2 of shock (54%),with Atonic PPH. (62%)

Table No 3: Distribution Based on Vital Parameters, Shock Index, Duration of NASG Application.

PARAMETERS	BEFORE NASG	AFTER NASG
PULSE RATE	131.48	94.520
SBP	97.00	118.760
DBP	61.280	78.920
MAP	79.14	92.187
SHOCK INDEX		

0.5-0.9	5(10%)	43(86%)
1.0-1.5	36(72%)	6(12%)
>1.5	9(18%)	1(2%)
DURATION OF NASG APPLICATION	**FREQUENCY**	**PERCENTAGE**
<12 Hrs	2	4%
12-24 Hrs	47	94%
>24 Hrs	1	2%
SHOCK INDEX	**AFTER 30 MINS OF NASG APPLICATION**	**AFTER 1 HR OF NASG APPLICATION**
0.5-0.9	12(24%)	38(76%)
1.0-1.5	37(74%)	11(22%)
>1.5	1(2%)	1(2%)

Table 3: The mean pulse rate for 50 women was 131.48/min before NASG was applied and then it reduced to 94.520/min after NASG was applied. There was marked improvement in systolic blood pressure, diastolic blood pressure, mean arterial pressure and shock index after the application of NASG. Majority of the women required NASG application for 12-24 hrs for stabilisation. The 76 % women regained normal shock index (0.5- 0.9) after 1 hr of NASG application, and 74% women had shock index improvement after 30 mins of NASG application.

Table No 4:Distribution Based on Risk Factors of PPH:

PARAMETERS	**FREQUENCY**	**PERCENTAGE**
RISK FACTORS		
Abruptio Placenta	9	18%
HDP	6	12%
Retained Placenta	6	12%
Moderate to Severe Anaemia	5	10%
Polyhydramnios	4	8%
Prolonged Labour	4	8%
Placenta Previa	4	8%
IUFD	4	8%
Multifetal Gestation	3	6%
HbsAg	2	4%
Grand Multipara	2	4%
Placenta Accreta Spectrum (PAS)	1	2%

Table 4: In the present study, most common risk factor seen was Abruptio placenta (18%), followed by HDP (12%) , retained placenta (12%) , moderate to severe Anaemia (10%), polyhydramnios (8%), prolonged labour (8%), Placenta previa (8%), IUFD (8%), multifetal gestation (6%) , HbsAg (4%), grand multipara (4%) and placenta accreta spectrum (2%).

Out of 50 women .49(98%) had survived PPH following the use of NASG, and 1(2%) woman had died even after NASG application. The NASG was not associated with any side effects. It was observed that when NASG was properly applied there were no signs of any discomfort. There were no episodes of nausea, vomiting, and abdominal pain and respiratory distress with NASG use. Hence, it proved to be safe for use.

DISCUSSION

In the present study, out of 50 women in PPH the mean age of the women was only 24.32 yrs, this is because of early age of marriage in Indian culture and lack of contraceptive use. This result is consistent and in conjecture with other studies i.e. Bangal et al[8], Amale et al[9], Escobar et al[2] and Kulshrestha et al[3]. The mean age of Miller et al study was 26.9 yrs. The age ranges from 21-25 yrs. The study done by Miller et al[4] study is outside India, while rest of the studies have been done in India. Hence, mean age is more in studies authored by Miller et al[4].

In this study, majority of women 29(58%) had education up to secondary level, 18 (36%) women had education up to higher secondary level. Only 2(4%) women were graduated and only 1(2%) woman had primary level of education. In Escobar et al[2] study majority of women had higher secondary 36(47%) level of education and in Bangal et al[8] study 10 (40%) women had secondary level of education which is consistent with our study. Our study area has people who are not inclined to educate females in higher education so, the population in graduates and postgraduates is very less.

In our study, 26(54%) women were unbooked and only 24(48%) women were booked , indicating lower literacy among women from rural area and early marriages and less awareness about the importance of antenatal care. In Bangal et al study[8] 21(84%) women were unbooked, and 4(16%) women were booked . This is in conjecture with our study. In Escobar et al[2] study 70 (91%) women were booked, and 7(9%) women were unbooked, in whom PPH occurred, which is in contrast to other studies, as it is done abroad. When the patients are unbooked, Antenatal workup is not done properly; they carry the pregnancy with existing Anaemia. It should be treated, so that the capacity to withstand the blood loss is more which is not done with unbooked cases and therefore, it reinforces the importance of Antenatal care.

Out of 50 women, majority 34 (68%) women were multipara, 14(28%) women were primipara and only 2 (4%) women were grand multipara. In Bangal et al[8] study majority of women 20(80%) women were multipara, 4(16%) women were primipara and only 1(4%) woman was grandmiultipara. In Kulshrestha et al[3] study 67(67%) women were gravida two to gravida four, 20(20%) women were gravida one and 13(13%) women were gravida five or more. In Escobar et al[2] study 33 (43%) women were multipara, 40(52%) were Primipara and only 4(5%) women were grand multipara. As multigravida are prone to anaemia and there is short interconceptional period between two pregnancies, which predisposes them to higher risk for PPH and morbidity. Moreover, in Primigravida, pregnancy being first one, health services are approached early and ANC care is taken appropriately whereas with experience of first pregnancy there is callous attitude in the next pregnancy. The 28% incidence of PPH in our study in primigravida's is a matter of concern. In the study conducted by Escobar et al[2]. (2017) more PPH occurred in Primigravida i.e. 40 (52%) in contrast to studies that have been conducted elsewhere where more deaths have occurred in multigravida.

In the present study, majority of the cause of PPH was atonicity 62% , mixed PPH accounted for 20% of cases, 12% cases were of tissue PPH and 6% cases were of traumatic PPH. In Escobar et al[2] study 75% of women had atonicity,15% women had tissue PPH, 6% women had traumatic PPH, and 4% women had mixed PPH. In Bangal et al[8] study there were 88% cases were of Atonic PPH, 6% cases were of traumatic PPH, and 6% cases were of mixed PPH. In Kulshrestha et al[3] study ,74% women had atonic PPH, 19% women had traumatic PPH, 4% women had mixed PPH, and 3% women had tissue PPH. In Amale et al[9] study there were 51% cases of Atonic PPH, 38% cases of traumatic PPH, 4% cases had tissue PPH and 7% cases of mixed PPH. The results of all studies are in conjecture with our study and the most common cause of PPH is atonicity. The major pool of deaths were also claimed by atonic PPH in all the studies mentioned above.

In the present study, out of 50 women, 72% women had shock index between 1-1.5,18% women had SI more than 1.5 and10% women had SI between 0.5-0.9 before NASG application . There was dramatic improvement in shock index after NASG application with maximum women 86% having SI between 0.5-0.9, 12% women having SI between 1-1.5 moreover, only 2% women having SI more than 1.5 even after NASG application. In Escobar et al[2] study out of 77 women 81% had SI between 1-1.5 and 19% women had SI more than 1.5 before NASG application. After the application of NASG there was a drastic improvement in the shock index of 0.5-0.9 in 97% women and 1-1.5 in 3% of women. In Bangal et al[8] Study, out of 26 women 68% women had SI between 1-1.5 ,32% women had SI more than 1.5 before NASG application, which improved to 0.5-0.9 in 92% women and 1-1.5 in 8% women after NASG application. Hence, from this we can infer that all studies favour the use of NASG. Only 2% i.e.1 woman's shock index did not improve despite all resuscitative measures and definitive treatment as patient had irreversible shock due to mixed (Atonic + DIC) PPH.

In the present study, NASG was applied for 12-24 hrs in 47(94%) women NASG was applied for more than 24 hrs in 1 (2%) woman, and only 2 (4%) women had NASG applied for less than 12 hrs. In Bangal et al[8] study 13(52%) women

had NASG applied for 12-24 hrs,10 (40%) women had NASG in situ for less than 12 hrs, 2 (8%) women had NASG for more than 24 hrs. In Amale et al[9] study 26(62%) women had NASG applied for 12-24 hrs,15(6%) women had NASG applied for less than 12 hrs, and only 1 (2%) woman had NASG applied for more than 24 hrs. The results of other studies are consistent with our study. From this we can infer that 12-24 hrs of application was required for patient stabilisation and this time period application was also associated with higher survival rate. Therefore, availability of at least 2 NASG 's in institute like ours where the no. of cases of PPH are more is must so that all patients are given the benefit of NASG .

In the present study, out of 50 women, 49(98%) women had survived and 1 (2%)woman died even after resuscitation, definitive medical and surgical management. Our results were consistent with Miller et al[4] study, Amale et al[9] and Magwali et al[10] study. In Bangal et al[8] study, 96% women had survived, and 4% women had died. From this the benefit and role of NASG in reducing maternal mortality is stressed. 1 (2%) woman had died in our study as she had presented to us late in haemorrhagic shock due to mixed PPH (atonic + DIC) and shock index remained high despite all resuscitative measures and definitive management.

The NASG was not associated with any side effects. It was observed that when NASG was properly applied there were no signs of any discomfort. There were no episodes of nausea, vomiting, and abdominal pain and respiratory distress with NASG use. Hence, it proved to be safe for use.

CONCLUSION

We have found in our study that, we need to take care of young women, who are from rural poverty-stricken area, are unemployed with poor education and with poor compliance to antenatal care. Utilizing the golden hour, immediately after PPH sets in with NASG as first aid device in conjunction to other definitive medical and surgical management is the key in saving mothers from massive PPH. NASG is useful when there is massive PPH, it buys some time for women in PPH until blood & blood products, definitive surgical interventions are provided. The NASG can stabilize a patient while awaiting transport, during transport or during delays in receiving care at referral facilities and increase their chance of survival until definitive treatment is obtained. It addresses the immediate life threatening complication by returning the blood to the heart, lungs and brain by applying pressure on the lower body and abdomen. The use of NASG is as good as internal iliac artery ligation. The NASG is not a replacement to definitive treatment. It is cost effective, reusable and a viable tool with no major side effects and discomfort to reduce the maternal mortality in all cases of PPH.

Limitation of Study: This study has a limitation of seeing only 50 cases.
Ethics Approval and Consent to Participate: Institutional ethics committee approval was taken for the present study.

List of Abbreviations:

NASG: Non pneumatic Anti shock garment, MDSR Maternal death surveillance review, MDG: millennium de elopement goal, PPH: Post partum Hemorrhage, SBP: systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure,

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Conflict of Interest: The authors declare that they have no conflict of interest

Authors Contribution:

Dr AP Developed the study proposal, managed research implementation, data collection, analyzed data and wrote the manuscript. Dr. BVK Developed the study protocol, assisted with data analysis, assisted in data collection and reviewed the manuscript. Dr VYK, Dr SNG assisted with development of study proposal, reviewed final manuscript. All authors have read and approved the manuscript.

REFERENCES

1. Yamin AE, Boulanger VM(2014). Why global goals and indicators matter: the experience of sexual and reproductive health and rights in the Millennium Development Goals. Journal of Human Development and Capabilities;15(2-3):218-31.
2. Escobar, María Fernanda et al(2017). "Experience in the use of non-pneumatic anti-shock garment (NASG) in the management of postpartum haemorrhage with hypovolemic shock in the Fundación Valle Del Lili, Cali, Colombia." Reproductive health vol. 14,1 58, doi:10.1186/s12978-017-0325-2
3. Kulshreshtha, S., & Jain, P. Application of Non Pneumatic Anti-Shock Garment (NASG) in 100 patients of postpartum haemorrhage: analysis of causes, management and outcome in a tertiary centre of south Rajasthan.
4. Miller S, Lester F, Hensleigh P(2004). Prevention and treatment of postpartum hemorrhage: new advances for low-resource settings. J Midwifery Womens Health;49:283–92
5. Escobar MF, Füchtner CE, Carvajal JA, Nieto AJ, Messa A, Escobar SS, Monroy AM, Forero AM, Casallas JD, Granados M, Miller S(2017). Experience in the use of non-pneumatic anti-shock garment (NASG) in the management of postpartum haemorrhage with hypovolemic shock in the Fundación Valle Del Lili, Cali, Colombia. Reproductive health;14:1-8.

6. Miller S, Turan JM, Ojengbede, A, et al(2006). The pilot study of the nonpneumatic anti-shock garment (NASG) in women with severe obstetric hemorrhage: combined results from Egypt and Nigeria. Proceedings of the International Congress on Evidence Based Interventions to Prevent Post Partum Hemorrhage: Translating Research into Practice, Goa, India.
7. Brees C, Hensleigh PA, Miller S, Pelligra R(2004). A non-inflatable anti-shock garment for obstetric hemorrhage. Int J GynaecolObstet;87:119–24
8. Bangal VB, Gavhane S, Raut S, Thorat U(2019). Use of non-pneumatic anti shock garment in hemorrhagic shock. International Journal of Reproduction, Contraception, Obstetrics and Gynecology;8(2):621.
9. AnuyaPawde, SudhRaniGandi, Soumya Agarwal, Sriram Gopal(2023). Modern Contraceptives- KAP study among women at a tertiary care hospital. MedPulse International Journal of Gynaecology; 25(1): 01-05
10. Magwali TL, Svisva A, Bowers T, Chiyaka F, Conway JD, Madzima B, Mambo V, Mangwiro A, Carmone AE(2021). Applying the RE-AIM framework in a process evaluation of the introduction of the Non-Pneumatic Anti-Shock Garment in a rural district of Zimbabwe. Plos one;16(5):e0251908.