Original Research Article

# Clinical study of Non-pneumatic anti shock garment (NASG) in patients with post-partum haemorrhage at a tertiary hospital

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## Abstract

**Background:** Etiologies of PPH include uterine atony, retained placenta, ruptured uterus, vaginal/cervical lacerations or placenta accreta. An observational study suggested that NASG use adds some time for postpartum haemorrhage women until definitive treatment can be reached, especially in other aetiologies rather than ruptured uterus. In present study, we aimed to study on use of non-pneumatic anti shock garment (NASG) in patients with post-partum haemorrhage at a tertiary hospital. **Material and Methods:** This descriptive, case record study was conducted in pregnant women who presented with PPH (loss of more than 500 or 1000 milliliters (mL) after vaginal delivery or Caesarean section, respectively), with hemodynamic instability (hypovolemic shock), and clinical indicators confirming hypoperfusion where NASG was used. **Results:** In present study, total 42 case records of patients with PPH were studied. Mean age was 24.6 ± 3.7 years, mean parity was 1.3 ± 0.9. Mean shock index at the time of NASG application was 0.6 ± 0.5 while mean shock index at the time of NASG removal was 1.3 ± 0.3. In present study NASG was commonly used in atonic PPH (50%) and traumatic PPH (38%). NASG was used in 64% vaginal deliveries and 26% of caesarean deliveries. NASG was applied for 13-24 hours in 62% patients. Only 1 patient required application for >24 hours. 1 patient with irreversible shock was died even after NASG application and other measures to control PPH. **Conclusion:** NASG helps in managing hemorrhagic shock and can be used at the same time with other hemorrhage and shock treatments, such as: uterine massage, uterotonics, blood transfusions, vaginal procedures and surgery, uterine balloon tamponade.

**Keywords:** Non pneumatic Antishock garment, Post-partum hemorrhage, shock index, atonic PPH

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## INTRODUCTION

Severe 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 (1000 mL of more) or any bleeding with hypotension or blood transfusion.[1] Etiologies of PPH include uterine atony, retained placenta, ruptured uterus, vaginal/cervical lacerations or placenta accreta. The Non-pneumatic Anti-Shock Garment (NASG) is a device developed as a temporizing measure to regain hemodynamic stability and allow patient transfer or definitive PPH treatment. The NASG is a compression suit made of five neoprene segments that close tightly with Velcro around the legs, pelvis and abdomen.[2] The International Federation of Gynaecology and Obstetrics (FIGO) has recommended that NASGs be used for clinical stabilization and transport of all women with PPH from lower to higher levels of

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care.[3] An observational study suggested that NASG use adds some time for postpartum haemorrhage women until definitive treatment can be reached, especially in other aetiologies rather than ruptured uterus.[4] In present study, we aimed to study on use of non-pneumatic anti shock garment (NASG) in patients with post-partum haemorrhage at a tertiary hospital.

## MATERIAL AND METHODS

This study was conducted in the Department of Obstetrics and Gynecology, XXX Medical College, XXX. Present study was of descriptive, case record study. Case records of patients with PPH where NASG was used, from Jan 2019 to Dec 2019 were studied. Study approval was obtained from institutional ethical committee.

### Inclusion criteria

Pregnant women who presented with PPH (loss of more than 500 or 1000 milliliters (mL) after vaginal delivery or Caesarean section, respectively), with hemodynamic instability (hypovolemic shock), and clinical indicators confirming hypoperfusion where NASG was used.

### Exclusion criteria

- Women admitted to the institution with an NASG from other institutions,
- Women with haemodynamic alterations due to conditions other than PPH for e.g. Cardiac diseases,
- Women with haemorrhage prior to delivery due to an obstetric aetiology,
- Women with previously documented coagulation disorders.

Demographic, clinical details, treatment, complications and outcome were studied. In all women, Shock Index (SI), the ratio between the heart rate and the systolic blood pressure, was measured at the time of diagnosis.

NASG was used to control bleeding in conjunction with the institutional clinical protocol for the management of PPH. The standard medical protocol for PPH treatment is mentioned below.

a. Medical management – uterotonics, (oxytocin, methylergometrine, PGF2 alpha,PGE1, intravenous fluids, blood and blood products transfusion, vitamin K, tranexamic acid).
b. Maneuvers -bimanual uterine compression, balloon tamponade (condoms, surgical gloves), aortic compression
c. Surgical management –repair of tears, compression sutures (modified B Lynch), arterial ligation (uterine, internal iliac), hysterectomy (subtotal/total).

Timing of removal of NASG, clinical outcome, need for surgical interventions, hospital stay were noted. The data analysis was done using descriptive statistics.

## RESULTS

In present study, total 42 case records of patients with PPH were studied. Mean age was 24.6 ± 3.7 years, mean parity was 1.3 ± 0.9. Mean shock index at the time of NASG application was 0.6 ± 0.5 while mean shock index at the time of NASG removal was 1.3 ± 0.3.

**Table 1:** General characteristic

| Characteristic | Mean ± SD / No. Of patients (Percentage) |
|---|---|
| Age (in years) | 24.6 ± 3.7 |
| Parity | 1.3 ± 0.9 |
| Mean shock index at the time of NASG application and removal | 0.6 ± 0.5 |
| Mean shock index at the time of NASG removal | 1.3 ± 0.3 |
| Mortality | 1 (2%) |

In present study NASG was commonly used in atonic PPH (50%) and traumatic PPH (38%). NASG was used in 64% vaginal deliveries and 26% of caesarean deliveries.

**Table 2:** Distribution of PPH patients

| Prominent cause of PPH | Mode of delivery | | | Total |
|---|---|---|---|---|
| | No. Of patients (Percentage) | | | |
| | Vaginal delivery | Caesarean section | Instrumental | |
| Atonic | 16 (38%) | 4 (10%) | 1 (2%) | 21 (50%) |
| Traumatic | 6 (14%) | 7 (17%) | 3 (7%) | 16 (38%) |
| Retained tissue | 4 (10%) | 0 | 0 | 4 (10%) |
| Coagulation defect | 1 (2%) | 0 | 0 | 1 (2%) |
| **Total** | **27 (64%)** | **11 (26%)** | **4 (10%)** | **42** |

NASG was applied for 13-24 hours in 62% patients. Only 1 patient required application for >24 hours.

**Table 3:** Duration of application of NASG

| Duration of application of NASG | No. Of patients (Percentage) |
|---|---|
| <6 hours | 3 (7%) |
| 6-12 hours | 12 (29%) |
| 13-24 hours | 26 (62%) |
| >24 hours | 1 (2%) |

## DISCUSSION

Most of maternal deaths and complications are preventable, treatable, and develop during pregnancy. Other complications may exist before pregnancy but are worsened during pregnancy, especially if they go unnoticed during antenatal care.[5] The proportion of maternal deaths attributable to PPH varies considerably between developed and developing countries.[6] The timely diagnosis and treatment of anemia and pre-eclampsia/eclampsia (seizures in pregnant women related to high blood pressure) and the administration of a uterotonic (agents used to induce contraction or greater tonicity of the uterus) immediately after the birth help to prevent PPH.[7] Proper management of PPH can save many lives, though it depends on a number of factors, like the accessibility and availability of healthcare facilities, skilled birth attendant, timely diagnosis, treatment, and adequacy of blood transfusion services.[8] Shock Index (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.[9,10] It is assumed that the NASG increases circulating blood volume by compressing (and thus depleting) venous reservoirs in the abdomen and legs, and it is further hypothesized that blood flow in the pelvis and lower abdomen is diminished by the uterine compression ball. Based on the same principle as the PASG (pneumatic anti shock garment), circumferential counter-pressure, but without air bladders, manometers, stopcocks, foot pumps and tubing, and without the associated risks of over-inflation and excessive pressures, the NASG (Non-pneumatic anti shock garment) is a promising first-aid treatment for hypovolemic shock resulting from obstetric hemorrhage.[11,12] A systematic review on NASG noted that, NASG fared better than standard care regarding maternal mortality reduction and a non-significant reduction of maternal mortality risk was observed. Severe maternal outcomes were used as proxy for maternal death with similar pattern corroborating the trend towards beneficial effects associated with NASG.[13]A systematic review (n = 2330) showed a significant reduction in mortality, loss of blood, and a more rapid recovery of shock index (SI) in women when NASG was used.[14] A systematic review of NASG studies showed a significant 39%−60% reduction in mortality for recipients.[15] Escobar MF *et al.*,[16] studied 77 women that received NASG in the management of PPH with severe hypovolemic shock were studied. 77% women had an SI > 1.1 at the time shock management was initiated; 96% had uterine atony. The average time between the birth and NASG applications was 20 min. Forty-eight percent of women recovered haemodynamic variables in the first hour and 100% within the first 6 h; 100% had a SI < 1.0 in the first hour. The NASG was not removed until definitive control of bleeding was achieved, with an average time of use of 24 hours. They noted that NASG was an effective management device for the control of severe hypovolemic shock and should be considered a first-line option for shock management. Similar findings were noted in present study. Maknikar *et al.*[17] reported 1,541 women with severe PPH (blood loss >1 L). Of these, 260 women had shock as suggested by a systolic blood pressure <90 mm Hg or pulse rate >100 beats/minute. 139 women received NASG while 121 women served as control group. Both the groups received appropriate care according to standard guidelines. There was a trend (p = 0.07) toward decreased mortality with the use of NASG among all women (n = 260), while there was a significant reduction in mortality (p = 0.01) when only women with severe shock (n = 122) were analyzed. Kulshreshtha S *et al.*,[18] studied 100 cases of PPH, most common cause of PPH was atonic uterus (77%), of which commonest etiology was maternal anemia (37.6%). Next common cause was trauma of genital tract (19%) out of which vaginal injuries were the most common (47.36%). Other rare causes were tissue factor (3%) and coagulopathies (1%).67% of the study participants had normal delivery while 29% patients had caesarian sections and remaining(4%) had instrumental delivery. After NASG application, 53% patients responded to medical management, 32% were managed surgically and rests 15% were stabilized by maneuvers. 57% patients stayed for three days in the hospital while 29% stayed for five days. Only 3% patients had a hospital stay of more than 6 days. The non-pneumatic anti-shock garment (NASG) is a first-line intervention for the management and stabilization of women with PPH in hypovolemic shock. Currently, it is the only tool that aids in stabilizing pulse and blood pressure after a woman has gone into shock from obstetric hemorrhage. In low-resource settings where delays in management of PPH occur, first aid is needed to stabilize women and increase their chances of survival until definitive treatment is obtained. NASG is uniquely suited for use in developing countries due to its simple design and relatively low cost. In low-resource settings, even at the highest-level referral hospital, there is often a long delay in receiving blood transfusions or surgery, therefore the NASG can be used in facilities where women often wait hours for blood and surgery.

## CONCLUSION

NASG use adds some time for postpartum haemorrhage women until definitive treatment. NASG helps in managing hemorrhagic shock and can be used at the same time with other hemorrhage and shock treatments, such as: uterine massage, uterotonics, blood transfusions, vaginal procedures and surgery, uterine balloon tamponade.

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