

NASG- A Perfect First Line Life Saving Wrap

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ABSTRACT

BACKGROUND

Majority of deaths due to postpartum haemorrhage (PPH) can be avoided through the use of prophylactic uterotonics during the third stage of labour and by timely and appropriate management. The purpose of this study was to evaluate the usage of NASG at our center in cases with obstetric haemorrhage & shock.

METHODS

We describe a total of 51 women who received NASG at our institute for obstetric haemorrhage & shock from December 2016 to September 2017. Their demographic characteristics, vital signs, & shock index, before and after application of NASG were studied & compared.

RESULTS

Most women wrapped in NASG were in the age group 20 - 25 years (49%), 91% (46) were unbooked, 73% (37) were of rural background, 60.78% (31) were postpartum at admission. NASG was applied to 90% (46) at our center while only 5 came with the device on. Most common indication was atonic post-partum haemorrhage & it was kept on for 24 - 48 hours in most. 41 (80%) women did not require any surgical intervention after being wrapped in the garment. Peripartum hysterectomy was the commonest surgical intervention 05 (10%), 92% were given blood & blood products. We were able to save 46 (90%) women given NASG. The vital parameters & shock index improved remarkably in most women.

CONCLUSIONS

NASG emerged as an effective tool in managing shock due to obstetric haemorrhage. We recommend it as a front-line option for shock management.

KEY WORDS

NASG (Non-pneumatic Anti-Shock Garment), Obstetric Haemorrhage, Shock, Adverse Maternal Outcome

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BACKGROUND

While postpartum haemorrhage is a killer, it is also one of the few obstetric complications with proven interventions. Postpartum Haemorrhage (PPH) is commonly defined as a blood loss of 500 ml or more within 24 hours after birth. PPH is the leading cause of maternal mortality in low-income countries and the primary cause of nearly one quarter of all maternal deaths globally. Most deaths resulting from PPH occur during the first 24 hours after birth: the majority of these could be avoided through the use of prophylactic uterotonics during the third stage of labour and by timely and appropriate management. Improving health care for women during childbirth in order to prevent and treat PPH is an essential step towards the achievement of the Millennium Development Goals.¹ Three of the leading maternal health organizations, The World Health Organization (WHO), International Federation of Gynaecology and Obstetrics (FIGO) 2012 guidelines, and the Global Library of Women's Medicine (GLOWM) all recommend the NASG as a device to stabilize women experiencing hypovolemic shock secondary to PPH.²

A garment for lifesaving support- The NASG is a simple, stretchable neoprene and Velcro device. It can be used to treat shock, resuscitate, stabilize and prevent further bleeding in women with obstetric haemorrhage. It is light, flexible and comfortable for the wearer, affordable, available, and accessible. The NASG is uniquely suited for use in low-resource countries due to its simple design and relatively low cost. After decontamination and laundering, the device can be re-used up to 40 times. Currently, the device costs about Rs 3,000 and training for application is relatively brief. It has been designed to allow perineal access so that examinations and all vaginal procedures can be performed without it being removed, for abdominal procedures the segment 4, 5 & 6 are removed just before incision and are quickly reapplied once surgery is complete. It can keep a mother alive until she reaches a health facility & is treated for postpartum haemorrhage. The mechanism of action is based upon laws of physics. It significantly increases the resistive index of the internal iliac artery (which is responsible for supplying the majority of blood flow to the uterus via the uterine arteries) and decreases blood flow in the distal aorta. This counter-pressure to the lower body may reverse shock by returning blood to the vital organs. The garment is applied first to the lowest possible extremity (the ankles), then upwards until the abdominal segment (segment 6).

We explored our hospital records for the areas from where maximum number of cases with PPH were referred, what causes the haemorrhaging mothers in our institute to succumb and to plan strategy to improve their outcome. We found that there were definite shortcomings in the health care services at periphery in terms of delay in seeking care, estimation of blood loss at delivery, delay in recognizing PPH, shock, and delay in transfer of these women. Collectively all these factors probably result in mothers either not able to reach a higher center or reach too late to survive.

At our center also because of heavy workload the definitive treatment of these women may be delayed until Operation Theater is available. To improve outcome in these transported and the women awaiting surgery –NASG appeared to be the appropriate intervention to try. We decided to use NASG on women with obstetric haemorrhage & shock, especially those awaiting surgery. Published papers have reported the utility of the NASG for women with obstetric haemorrhage from all etiologies in low-resource referral facilities.^{3,4,5,6} In this article, we explored the effect of the NASG application on women experiencing PPH at a tertiary care center of western Rajasthan with one of the highest delivery loads per month (about 2400/month).

METHODS

This case series was conducted from December 2016 to November 2017 at Umaid hospital department of Obs. & Gyne. Dr. S.N.M.C. Jodhpur, a tertiary care center in Western Rajasthan. Data were collected from the clinical records in patient files. The variables of interest like-the demographic variables, variables related to the haemorrhage aetiology, management, and outcomes of the mothers were collected and analysed. All women and their families were informed of the need to use NASG, and were also informed regarding the technical, health, and safety aspects of the device. The case series included all the pregnant women who presented with PPH (loss of more than 500 or 1000 millilitres (mL) after vaginal delivery or Caesarean section, respectively), with haemodynamic instability (hypovolemic shock), and clinical indicators confirming hypo perfusion. NASG was applied immediately on recognition of significant obstetric haemorrhage We used the NASG to control bleeding in conjunction with the institutional clinical protocol for the management of PPH. NASG was removed only after stabilization of the woman for at least 2 hrs (pulse <100 , BP >90 -100 mmHg, urine output >50 ml/hr abd bleeding <50 ml/hr). In all women, Shock Index (SI), the ratio between the heart rate and the systolic blood pressure, was measured at the time of diagnosis. SI has been studied in the obstetric population as a valuable marker of haemodynamic 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. The institutional clinical protocol for the management of PPH included securing two wide bore IV lines, SR catheterization, vital monitoring, use of uterotonic drugs (oxytocin being the first choice, followed by methylergometrine and misoprostol in standard doses after ruling out contraindications), Bimanual uterine compression in case of atonic uterus, exploration of genital tract for retained tissue and to exclude traumatic causes & repair of lacerations. Blood samples sent for cross match & investigations to rule out coagulopathy. Finally, blood transfusion and surgical interventions carried out as required.

Statistical Analysis

All statistical analyses were performed by using SPSS 22.0 software package (SPSS Inc., Chicago, IL, USA). Student “t” test paired and unpaired, Yates continuity correction test *(Chi square test), Fisher’s exact test and Fisher---Freeman--Halton test will be used for comparison of qualitative and qualitative data. All data were summarized as mean ± SD for continuous variables, numbers and percentages for categorical variables. A p < 0.05 was accepted as statistically significant.

RESULTS

We at our center applied NASG to a total of 51 women with hypovolemic shock mainly due to PPH & other causes of OH. The most common age group was 20-25 years (49%), the youngest woman was 20 years while the oldest was 35 years. They were more from rural than urban areas, 37 (73%) & 14 (27%) respectively. Most of them (46 i.e. 91%) were not ANC booked with us and 34 (66.66%) were referred from different peripheral hospitals as ours is a tertiary center catering to about five districts.

At the time of admission maximum women 31 (60.78%) were postpartum, 18 (35.29%) antepartum, one post-abortion haemorrhagic shock and one with profusely bleeding H Mole. Primigravida/para comprised only 13 (25%) while most 75% were gravida/para 2 and above with gravida 3 & above being the largest group (61%).

NASG was applied to 46 (90%) women in shock at our center and only 5 (10%) were brought in NASG from the referral hospital. The vital parameters of the women in shock improved remarkably after NASG application. The shock index was >0.9 in 46 (96%) women before application of NASG and stabilized in 9 of them after 15 min of application while taking longer in the rest.

The most common indication for NASG application was atonic PPH alone 17 (33%), followed by atonic PPH with shock 14 (27%). Seven (14%) were put in NASG for traumatic + atonic PPH with shock, 3 for traumatic +Atonic PPH, 2 for PPE with shock and one each with APE post LSCS with shock, profusely bleeding H Mole with shock, post abortion haemorrhagic shock, ruptured cornual ectopic pregnancy in shock, Postpartum rupture uterus with shock, uterine inversion in shock, Septic shock and prophylactically in one NASG was removed within 24-48 hours in most women 41 (80%) after stabilization and was required for longer in the rest. The maximum that it had to be kept on was for about 144 hrs. Most women requiring NASG had delivered vaginally 43 (84%), 5 (10%) had CS, one underwent S & E for H Mole while another had MVA for post abortion bleeding.

41 (80%) women did not need any surgical intervention after NASG application. Peripartum hysterectomy 05 (10%) was the most common lifesaving intervention, followed by exploration under anaesthesia

and tear repair in 3 (6%) and uterine tamponade in 2 (4%) women.

Ventilator and vasopressor support was given in 28 (55%), only vasopressors in 9 (18%) women and only ventilator support in one while 25% of women with NASG did not require any support. Blood & blood products were given to 47 (92%) of them with most requiring more than 2 units. All but 2 women required ICU admission with most 27 (53%) staying in for 3-4 days. The shortest stay was 1 day and the longest was 14 days. 13 (25%) women had some co-morbidities like severe anaemia, APE, jaundice, placenta accrete and renal failure while 75% had no co-morbidities. 46 (90%) women using NASG survived but we were unable to save 5 (10%) of them.

Parameter	Total Number of Women: 51
Mean age of Patients (in years)	26.23±4.52
Gestational age at Admission (weeks)	38.19±2.60
Antenatal Care	
No. of visits –	38 (74.50%)
1-2	08 (15.68%)
3-4	18 (35.29%)
>5	25 (49.01%)
Booking Status	
Booked	05 (9.80%)
Unbooked	46 (90.20%)
Residence	
Urban	14 (27.45%)
Rural	37 (72.54%)
Literacy Status	
Illiterate	02 (3.92%)
Primary	03 (5.88%)
Middle	08 (15.68%)
Higher	16 (31.37%)
Graduate	22 (43.13%)
Referred Status	
Referred	34 (66.66%)
Non-referred	17 (33.34%)
Antepartum/Postpartum	
Antepartum	18 (35.29%)
Postpartum	31 (60.78%)
Postabortal	01 (1.96%)
H.Mole	01 (1.96%)
Parity at Admission	
Primiparous	24 (47.05%)
Second pregnancy	16 (31.37%)
Third pregnancy	8 (15.68%)
More than Three pregnancies	3 (5.88%)
No Previous Complications	38 (74.50%)
Type of Delivery	
Vaginal delivery	43 (84.32%)
Cesarean delivery	05 (9.80%)
Other procedures	03 (5.88%)
Days Hospitalize	7.92±4.39
Days Hospitalized in the ICU	3.94±2.22
Place of NASG App	
At UH	46 (90.20%)
At referral	05 (9.80%)
Blood Pressure at the Time of NASG Application	
Normotensive	10 (19.60%)
Hypertensive	00 (0%)
Hypotensive	34 (66.66%)
Not Recordable	07 (13.74%)
Pulse at the Time of NASG Application	
Normal	02 (3.92%)
Tachycardia	42 (82.35%)
Not Recordable	07 (13.72%)
Blood Pressure after 15 Minutes of NASG Application	
Normotensive	42 (82.35%)
Hypertensive	00
Hypotensive	09 (17.64%)
Not Recordable	00
Saturation (SPO₂)	
<90%	22 (43.13%)
>90%	29 (56.86%)

Table 1. Patient Characteristics

Shock Variable Shock Index (%)	When NASG Applied (n=51)	When NASG Removed (n=51)	P Value
0.5-0.9	03 (5.88%)	47 (92.15%)	<0.0001
1-1.5	41 (80.39%)	04 (7.85%)	<0.0001
>1.5	07 (13.72%)	00	NA

Table 2. Comparison of Diagnostic Variables for Shock and Hypoperfusion in Women with Post-Partum Haemorrhage at the Time of NASG Placement and Removal

Indications	No. of Patients	%
Atonic POST-PARTUM HAEMORRHAGE	17	33%
Traumatic + Atonic POST-PARTUM HAEMORRHAGE	03	6%
Atonic POST-PARTUM HAEMORRHAGE with shock	14	27%
Traumatic + Atonic POST-PARTUM HAEMORRHAGE with shock	07	14%
APE post LSCS with shock	1	2%
PPE with shock	2	4%
Molar pregnancy with shock	1	2%
Post abortal BPV	1	2%
Rupture ectopic with shock	1	2%
Post-partum rupture uterus with shock	1	2%
Uterine inversion with shock	1	2%
Septic shock	1	2%
Prophylactic	1	2%
Total	51	100%

Table 3. Indications of NASG Use

Duration of NASG (HRS)	No. of Patients	%
0-24	13	25%
25-48	28	55%
49-72	06	12%
73-96	01	2%
97-120	02	4%
121-144	01	2%
Total	51	100%

Table 4. Duration of NASG

Outcome	No. of Patients	%
Survived	46	90%
Expired	05	10%
Total	51	100%

Table 5. Maternal Outcome

($\chi^2=32.961$; d.f.=1; p <0.0001)

Year	Maternal Deaths	Deaths Due to Post-Partum Haemorrhage
2015	42	8 (19%)
2016	32	7 (21.8%)
2017	33	5* (15.1%)

Table 6. Trends of Maternal Mortality Due to Post-Partum Haemorrhage at Umaid Hospital Jodhpur

*In year 2017 out of these 5 mortalities 4 were referred cases.

DISCUSSION

The NASG device was introduced to our institute in Nov 2016 with full approval by the department, after a comprehensive review of the available evidence.⁷⁻¹³

In this observational study NASG appeared as a promising device in decreasing adverse maternal outcome in women with OH. Our findings of decrease in adverse maternal outcomes in women with OH after addition of NASG to the protocol of obstetric haemorrhage at our center suggests that this simple, inexpensive, reusable garment should be the first front-line approach used in all women with obstetric haemorrhage at all levels of health care facilities.

Many studies have highlighted its value during transportation of haemorrhaging women, we in addition

focused on using NASG at tertiary center with a high workload & found that it is of immense help in saving mothers who are awaiting blood transfusion or surgery. Many haemorrhaging women (80) did not require any other intervention to stop bleeding after NASG application.

CONCLUSIONS

When delays in management of PPH occur, first-aid is needed to resuscitate and stabilize women with hypovolemic shock until definitive treatment is obtained. Application of NASG reverses haemorrhagic shock and can stabilize a patient while awaiting transport, during transport, or during delays in receiving care at referral facilities. NASG is uniquely suited for use in low-resource countries due to its simple design and relatively low cost.

The need for new technologies & strategies to reduce the global burden of maternal mortality continues. Timely use of NASG has shown a positive result. We recommend its use as a front-line intervention in haemorrhaging mothers while transportation and awaiting definitive management. NASG would be most effective if made available at all levels of health care facilities & the transporting ambulances.

Financial or Other Competing Interests: None.

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