ORIGINAL RESEARCH

Access to antenatal blood pressure measurement in Malawi: Findings from a national census of health facilities

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Abstract

Aim

To identify service side factors associated with access to antenatal blood pressure measurement at health facilities in Malawi.

Methods

Secondary data analysis of 1499 observations of antenatal consultations undertaken in the Service Provision Assessment survey 2013-14, a census of all formal health facilities in the country.

Results

Differentials in access to antenatal blood pressure measurements by client age or educational status and provider gender or in-service training did not reach statistical significance although clinically important effects cannot be excluded. There was substantial variation among districts, ranging from 14% to 100% of observed consultations. Facilities in the Central and Southern regions had lower odds of providing blood pressure measurement relative to the Northern region (OR 0.17, 95% CI 0.03 to 0.30 and 0.11, 95% 0.04 to 0.31 respectively). Facilities affiliated to the Christian Health Association of Malawi and facilities under private management had higher odds of provision relative to government facilities (OR 3.24, 95% CI 1.71 to 6.11 and 5.77, 95% CI 1.87 to 17.79 respectively). Where observed consultations included taking the client's weight and measuring the symphysis-fundus height, the odds of blood pressure measurement were significantly increased (OR 6.4, 95% CI 3.32 to 12.34 and 1.71, 95% CI 1.01 to 2.88 respectively).

Conclusion

An indicator for effective coverage, the proportion of antenatal visits that included blood pressure measurement, recorded in health passports examined at the time of admission for delivery, should be tested for incorporation into the District Health Information System to enable tracking of quality improvement in antenatal care. Further research is needed to elucidate the reasons for the variations identified here.

Key words: Pregnancy Hypertension, Pre eclampsia, Antenatal care, Quality of Health Care, Service Provision Assessment

Introduction

While Malawi has seen substantial reductions in child mortality since 2010, neonatal and maternal mortality have been more resistant to programmatic interventions. This is despite increased utilization of maternity services; according to the 2015-16 Malawi Demographic and Health Survey, as many as 91% of births are now in health facilities and, for antenatal care, over half of women report attending four or more visits[1]. The realisation that adverse maternal and neonatal outcomes have persisted despite relatively high coverage of services has prompted a greater policy focus on the quality of clinical care that is provided in health facilities. Furthermore, recognition of the previously hidden burden of stillbirth in low resource countries such as Malawi has prompted attention to the actual care received during clinical contacts during the antenatal period and at the time of delivery, so as to prevent complications through timely intervention[2].

Historically, detecting and managing hypertensive disease was the main purpose of antenatal care, as it was appreciated from early public health work that eclampsia and its associated complications could, to a large extent, be averted by detecting pre-eclampsia[3]. Availability of functional equipment for measuring blood pressure is listed as one of this six basic items of equipment for clinical facilities and is included in the list of World Health Organization 'Service Availability and Readiness Assessment' (SARA) indicators, recommended to Ministries of Health for annual monitoring[4]. Presence of functioning equipment in a health facility is a necessary but not sufficient condition to ensure that clients and clinical staff have access to blood pressure measurement. However, obtaining data on actual clinical use in a systematic manner presents challenges. The Malawi Service Provision Assessment (MSPA) 2013-14[5] was a census of all formal health facilities in the country and included both a facility inventory of equipment (with documentation of its functionality) and observation of clinical consultations, thus providing an opportunity to examine the use of available equipment in clinical settings. In this study, we aimed to identify service side factors associated with access to antenatal blood pressure measurement at health facilities in Malawi.

Methods

Data

We used data from the 2013-14 Malawi Service Provision Assessment. This was a census of all formal health facilities under public, private, faith based, non-governmental organisation and company managing authority in the country, including hospitals, health centres, dispensaries and health posts. The methods and tools used in the census are

described in detail in the survey report [5] and comprised facility inventories across a range of clinical services and interviews with providers at all 997 facilities. Where appropriate, clinics and clients were available during survey visits, observations of outpatient consultations and exit interviews with clients attending for antenatal, family planning and curative child health services and observation of delivery and newborn care were undertaken.

Informed consent was sought for observation of consultations and participation in exit interviews. For the present study, we used anonymised data files made available for research purposes by the Demographic and Health Surveys (DHS) Program. The Institutional Review Board of ICF International, Inc., reviewed and approved the Demographic and Health Surveys Project Phase VII, and 2013-14 MSPA is categorized under that approval. The Institutional Review Board of ICF International complied with the United States Department of Health and Human Services regulations for the protection of human research subjects (45 CFR 46).

During the survey, 632 health facilities in Malawi were identified as offering antenatal services. Among these, records of observations of antenatal consultations were available for 412 facilities. Among these 412 facilities, functioning apparatus for measuring blood pressure, either a digital device or manual sphygmomanometer plus a stethoscope was documented for 309 facilities (75%) at which 1,499 antenatal consultations were observed. The age and educational attainment of clients whose consultations were observed were recorded in exit interviews. Provider characteristics including professional cadre, gender and access to training in antenatal care components including blood pressure measurement were also obtained.

Analysis

We used the statistical package Stata 14 (StataCorp LP, College Station, Texas, USA). Data files for facility, provider and client relating to antenatal care services were merged and variables of interest were tabulated.

Dependent variable

The dependent variable in all analyses indicated whether or not blood pressure measurement was observed during the antenatal consultation.

Independent variables

Geographical and facility-related independent variables were the region and district where the facility was located, rural or urban location, managing authority and whether the facility was a health centre, clinic or hospital. Provider-related independent variables were the providers' gender, professional group and whether and when they had received relevant in-service training. Client-related independent variables were age group and highest educational attainment. The selection of 'client side' independent variables was based on the possibility that providers might behave differently during consultations with younger clients such as adolescents, or with those of lower educational status; in some contexts, such clients may be treated less favourably in contacts with health services. On the service side, we wished to examine the possibility that different professional groups might undertake the mandated task to a different extent, or that male of female providers might exhibit different behaviours towards clients in a cultural setting where gender based behavioural norms might play a part. Finally, as much emphasis is typically placed on the importance of in-service training as a strategy for quality improvement, access to training for providers was also examined. To investigate clinical behaviour through possible associations between blood pressure measurement and other components of antenatal physical examination, we included four observed elements as independent variables. These were fundal height examination by palpation, symphysis-fundus height measurement with a tape measure, weighing and height measurement.

Analytical methods

A district-wise table showing the percentage of antenatal consultations at facilities with functional blood pressure apparatus where blood pressure measurement was observed was constructed and displayed graphically. Following initial cross tabulations, bivariate associations between blood pressure measurement and geographical, facility, provider and client related explanatory variables were examined and the statistical significance of differences estimated using χ^2 tests taking 5% probability as significant. We then developed a multiple logistic regression model including those variables significant at or below the 10% level. In all tabulations and analyses, sample weights were applied and analyses took into account the complex survey design with the facility as the primary sampling unit. Odds ratios, associated probabilities and 95% confidence intervals were estimated for the independent variables.

Results

The presence of functional blood pressure apparatus at health facilities where antenatal consultations were observed was statistically associated with non-Government managing authorities (P<0.001) but was not influenced by facility type or region. Most antenatal consultations were undertaken by enrolled midwives/ nurse-midwife technicians (55.3%), community health nurses (19.6%) or enrolled nurse-midwives (17.9%). diploma or bsn nurse-midwives, medical graduates, clinical officers or medical assistants undertook the remaining small percentage of consultations. District-wise variations in antenatal blood pressure measurement were noted, ranging from 100% of observed consultations (facilities in Chitipa and Karonga districts) to 14.1% (facilities in Machinga District) (Figure 1).

Statistically significant differences were noted between the regions of Malawi, with the Northern region showing the greatest percentage of blood pressure measurements, and with respect to facility managing authority; government facilities had a lower percentage of blood pressure measurements observed relative to Christian Health Association of Malawi-affiliated facilities and those under private and company management. Provider related variables including gender and training exposure were non-significant, as were client related variables of age and educational attainment (Table 1).

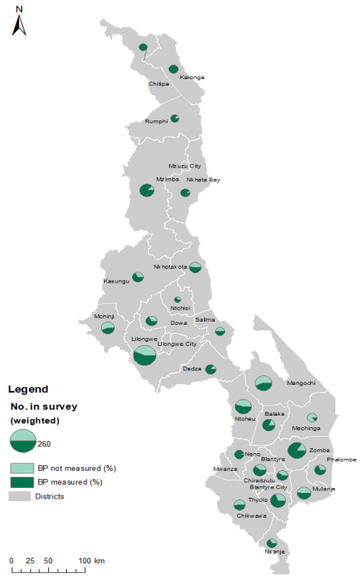

Figure 1: Weighted percentages of antenatal consultations at which blood pressure measurement was observed, in health facilities with functional blood pressure apparatus, by Malawi districts (Likoma omitted)

Table 1: Percentage of observed antenatal consultations that included blood pressure measurement, in facilities with functioning blood pressure apparatus, by facility, provider and client characteristics

	Observed antenatal consultations (weighted, total 1499)		
	BP Measured (%)	N in category	X^2 test P value
Region			
Northern	91.8	199	0.0018
Central	57.9	576	
Southern	63.5	734	
Location of Facility			
Urban	61.8	430	0.6342
Rural	66.2	1069	
Facility Type			
Hospital	68.9	606	0.5598
Health Centre	62.5	857	
Clinic	54.6	36	
Facility Managing Authority			
Government	57.0	1032	<0.0001
Christian Health Association of Malawi	80.7	411	
Private	85.0	21	
Company	100.0	35	
Provider gender			
Male	59.6	390	0.2696
Female	66.8	1109	
Provider had training that included antenatal blood pressure measurement			
Within the last 2 years	58.9	176	0.3129
More than two years ago	62.7	343	
No specific training	72.9	231	
Client Age Group			
Adolescent (<20)	59.6	298	0.1679
Young Adult (20-24)	65.7	567	
Older (25+)	66.9	592	
Client Education			
No school attendance	60.5	186	0.2894
Primary	64.4	930	
Secondary	67.1	335	
Higher education	64.9	48	

Symphysis-fundus height measurement and weighing of the client during antenatal consultations, but not palpation of the fundal height or maternal height measurement, were significantly associated with blood pressure measurement (Table 2).

Table 2: Percentage of observed antenatal consultations that included blood pressure measurement, in facilities with functioning blood pressure apparatus, by other antenatal examination procedures

		Observed antenatal consultations (weighted, total 1499)		
		BP Measured (%)	N in category	X^2 test P value
Weight	Taken	74.7	1172	<0.0001
	Not taken	29.8	327	
Height	Measured	82.7	85	0.1653
	Not measured	63.8	1414	
Fundal height	Palpated	64.8	1382	0.8059
	Not palpated	66.3	117	
Symphysis-fundus height with tape	Measured	72.7	636	0.0091
	Not measured	59.2	863	

Multiple logistic regression modelling identified geographical region, facility managing authority, symphysis-fundus height measurement and client weighing as significantly associated with blood pressure measurement (Table 3).

Table 3: Multiple logistic regression of observed blood pressure measurement against selected facility, provider and client characteristics

	Odds Ratio	p-value	95%CI Lower	95%CI Upper
Region				
Northern	Reference			
Central	0.17	<0.001	0.03	0.30
Southern	0.11	<0.001	0.04	0.31
Facility Managing Authority				
Government	Reference			
Christian Health Association of Malawi	3.24	<0.001	1.71	6.11
Private	5.77	0.002	1.87	17.79
Company	1	-	-	-
Weighing of the client				
Not done	Reference			
Done	6.40	<0.001	3.32	12.34
Symphysis-fundus height with tape measure				
Not measured	Reference			
Measured	1.71	0.046	1.01	2.88

Discussion

Our analysis indicates that there is a substantial gap in access to blood pressure monitoring during antenatal care in Malawian health facilities. While much of the variability in access relates to facility managing authority, with lower odds of access to blood pressure measurement in Government facilities, we also identified regional- and district-wise variations. Differences relating to certain client-side and provider-side factors did not reach statistical significance in our analysis but should be noted for potential further study. For example, there may be a deficiency in provision for adolescents relative to older clients which is of clinical significance considering their excess risk from hypertensive disease. One might have expected a greater effort by providers to ensure that blood pressure was checked for adolescent clients rather than the lower percentage observed (albeit not

statistically significant). Similarly, a non-significant trend to a lower standard of provision for un-educated clients was observed that deserves further scrutiny. Male providers undertook fewer blood pressure checks; while this difference did not reach statistical significance and female providers were more numerous, this may merit further study as to whether a true gender-based differential exists in maternity care in the Malawi context. Interestingly, an apparent (but again non-significant) adverse effect of in-service training related to antenatal care was seen. It is possible that the content or delivery of training is counterproductive as it may unintentionally focus providers' efforts onto other aspects of antenatal care and insufficiently reinforce the need for consistent blood pressure measurement. Again, further investigation would be needed to confirm whether this is a real influence.

We observed that blood pressure measurement was significantly more likely to be done where symphysis-fundus height was measured with a tape measure and where the client's weight was taken on the same occasion, suggesting that elements of clinical quality of care tend to be provided together. Our analysis was restricted to facilities at which the presence of functional apparatus for measuring blood pressure was documented during the Service Provision Assessment survey, thus the observed variations can be ascribed to provider behaviour rather than to equipment availability.

The present findings are consistent with the available population-based data from Malawi;83% of women reported that they had their blood pressure taken during their last pregnancy[1]. While this 'headline' figure may appear favourable, recall of what might have been a single blood pressure reading during the entire pregnancy falls far short of the clinical need to assure consistent checking of blood pressure at every antenatal visit and during admission for labour and delivery, not to mention appropriate further measures such as urine testing for protein and referral for pre-eclampsia[6].

In efforts to increase the quality of maternity service provision, approaches have been tested including those on the 'demand side' such as community mobilisation. Unfortunately, as hypertension is usually not symptomatic, there is a low level of awareness in the general population about the importance of blood pressure measurement during pregnancy. In a study of community perceptions of perinatal care in Malawi, women attached importance to receiving bed nets and medication during antenatal visits but did not mention blood pressure measurement[7]. "Service side" interventions such as performance-based financing of health facilities using defined service indicators have not proved successful to date in increasing access to blood pressure checking at the time of admission for delivery [8].

Internationally, attention has been focused on assuring access to essential commodities for maternal and newborn health care in low resource settings. Notably, the UN Commodities Commission identified 13 priority commodities that should receive particular attention[9]. Of these, two were directly related to maternal health care, magnesium sulphate for eclampsia and misoprostol for postpartum haemorrhage. Blood pressure apparatus and urine protein test sticks were not included at that stage, although this gap has been recognised in the agenda of the Reproductive Health Supplies Coalition more recently [10]. There have been very useful technological developments in reliable and low cost blood pressure measurement devices, now fully validated for African antenatal populations[11].

As our analysis indicates, simply providing functional equipment is necessary but not sufficient to assure access to blood pressure measurement for pregnant women. Similarly, access to in-service training would not appear to offer prospects for improvement in isolation and may even be counterproductive. Programming needs to address all elements of coverage so that 'effective coverage', in this case reliable and consistent measurement at each and every visit, can be achieved. Critical analysis of how women seek care, equipment and staff availability, clinical behaviour supported by training and followed up with measurement against quality standards, and the clinical response to abnormal results, all require consideration in an integrated manner so that 'bottlenecks' can be identified and addressed; the location of the 'bottleneck' can vary from district to district, requiring the ability to contextualise quality improvement efforts to the local level[12]. With regard to drivers of variability in access to blood pressure measurement, health facility workload is likely to be a factor especially in government-run facilities and may explain the better performance of CHAM and private facilities. However, the design of this survey does not allow researchers to capture the volume of cases in a particular service and relate this to staff deployment for that specific service: a more detailed health workforce and workload enquiry would be required to elucidate the observed differences in performance. Very often in human resource planning in the region, health service staffing norms are based on facility type rather than client numbers so that the small number of clinic staff may be overwhelmed with clients, resulting in 'short cuts' to speed up client flow. It is possible that there are also differences with regard to clinical protocols or monitoring of provider performance, such as chart reviews or local supervisory observations that could favourably influence performance. The better performance of facilities in the Northern region could be explained by a generally lower population relative to health worker and facility provision. However, according to the most recent DHS survey, while there is a more favourable pattern of antenatal blood pressure measurements (consistent with our findings), this is not the case for several other components of care, such as tetanus vaccination.

To achieve effective coverage and health benefits in preventing eclampsia and related complications in the current context of very high service utilisation, quality improvement initiatives need to add an indicator for blood pressure measurement during antenatal care and incorporate this into routine reporting in the District Health Information System. We consider that an appropriate numerator for this purpose would be the number of health passports with a blood pressure recorded at each antenatal visit, collected in facilities at the time of admission for delivery, with the denominator being the number of health passports examined. This indicator would provide rapid feedback to health facilities regarding the effectiveness of their antenatal service arrangements. Furthermore, combining this indicator with the existing routine service indicators of numbers of antenatal attendances per pregnancy and the proportion of women attending in the first trimester, it would be feasible and very informative to move on to undertake 'bottleneck' analysis at district level as part of a strategy to ensure complete and effective coverage. It would also allow useful

learning from better-performing districts so that strategies that have proved effective can be cascaded nationally.

Conclusion

Strengthening of procurement and maintenance of blood pressure machines at government health facilities is needed. An indicator for effective coverage, the proportion of antenatal visits that included blood pressure measurement, recorded in health passports examined at the time of admission for delivery, should be tested for incorporation into the District Health Information System to enable tracking of quality improvement in antenatal care. Further research is needed to elucidate the reasons for the variations identified here.

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