Overall adequacy of antenatal care in Oman: secondary analysis of national reproductive health survey data, 2008

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كفاية الرعاية العامة السابقة للولادة في عُمان: تحليل ثانوي لبيانات المسح الوطني للصحة الإنجابية، 2008

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الخلاصة: على الرغم من الحالة الصحية الجيدة للنساء والأطفال في عُمان، لاتزال هناك بعض الثغرات التي ينبغي سدُّها. فقد استطلعت هذه الدراسة مدى كفاية استخدام النساء العمانيات اللواتي سبق لهن الزواج للرعاية السابقة للولادة، والمحدِّدات الاجتماعية الديموغرافية ومحدِّدات الخدمات الصحية التي تحول دون الحصول على رعاية سابقة للولادة وافية وكافية. ففي تحليل ثانوي لمجموعة بيانات وطنية (العدد = 1852 امرأة) كانت النسب المئوية للنساء اللواتي لديهن أكثر من 4 زيارات للرعاية السابقة للولادة، واللواتي حضرن إلى الرعاية السابقة للولادة في الثلث الأول من الحمل، واللواتي تلقَّين رعاية من قِبَل موظفين مدرَّبين 96.8٪ و74.9٪ و99.1٪ على التوالي. وكانت كفاية الرعاية السابقة للولادة تستخدم لدى النساء اللواتي شملهن المسح هي 53.8٪. وبعد تصحيح تأثير المتغيرات المشاركة الأخرى، كان الحمل بالطفل الأول الهامَّ المنبِئ الوحيد بكفاية الرعاية السابقة للولادة بشكل عام (OR 2.2؛ 95% CI: 1.6–3.2). وخلص الباحثون إلى أن هناك حاجة إلى زيادة وعي الأمهات اللواتي لديهن أكثر من طفل بضرورة الرعاية الكافية السابقة للولادة.

ABSTRACT Despite the good health status of women and children in Oman, there are still some gaps to be filled. This study explored the adequacy of antenatal care (ANC) utilization of Omani ever-married women and the sociodemographic and health service determinants of adequate and sufficient ANC. In a secondary analysis of a national dataset ($N = 1852$ women), the percentages of women who had 4+ ANC visits, attended ANC in the 1st trimester and received care by trained personnel were 96.8%, 74.9% and 99.1% respectively. Overall adequacy of ANC (use and sufficiency of recommended basic services) for the surveyed women was 53.8%. After adjustment of other covariates, being pregnant with the 1st baby was the only significant predictor of overall adequacy of ANC (OR 2.2; 95% CI: 1.6–3.2). Greater awareness of the need for adequate ANC is required for mothers with more than one baby.

Adéquation globale des soins prénatals à Oman : analyse secondaire des données d'une enquête nationale sur la santé génésique, 2008

RÉSUMÉ Malgré la bonne santé des femmes et des enfants à Oman, il reste des lacunes à combler. La présente étude a exploré l'adéquation du recours aux soins prénatals par des femmes ayant été mariées à Oman et les déterminants sociodémographiques et des services de santé en termes de soins prénatals adéquats et suffisants. Dans une analyse secondaire d'un ensemble de données national ($N = 1852$ femmes), les pourcentages de femmes ayant bénéficié d'au moins quatre visites de soins prénatals, ayant reçu des soins prénatals au cours du premier trimestre de grossesse ou ayant été prises en charge par du personnel qualifié étaient de 96,8 %, 74,9 % et 99,1 %, respectivement. L'adéquation globale des soins prénatals (accessibilité et suffisance des services de base) était de 53,8 % selon les femmes interrogées. Après ajustement des autres covariables, être enceinte de son premier enfant était le seul facteur prédictif important de l'adéquation globale des soins prénatals (OR 2,2 ; IC à 95 % : 1,6–3,2). Une sensibilisation accrue au besoin de soins prénatals adéquats est requise pour les femmes ayant plus d'un enfant.

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Introduction

In its *Health development report* of 2010 the United Nations Children's Fund reported that during the period 1970–2010 Oman was the most improved country among 135 countries (*1*). These substantial improvements are attributed mainly to the country's rapid socioeconomic development and to the health plans of the Ministry of Health (MoH). In 1987 the MoH introduced maternal and child health services into primary health care (PHC) (*2*) and since 2001 has adopted a number of strategies to reduce morbidity and mortality (*3*). According to the Oman *Annual health report* for 2012, the average number of antenatal care (ANC) visits for registered pregnant women was 6 (*2*). ANC coverage for at least 1 visit has increased to 99.4%, while 4 or more visits reached 80.4% in 2012 and booking during the 1st trimester reached 66.5% (*2*). However, regional variations in the proportions of ANC coverage (Muscat, North Batinah and Alburaymi) and those registered in the 1st trimester (Dhofar) have been observed.

Despite the good health status of women in Oman, there is still room for improvement according to the National Health Survey in 2000 (*4*) and the Reproductive Health Survey (RHS) in 2008 (*5*). The RHS reported low use of birth spacing methods, particularly modern methods, and greater use of traditional methods compared with the National Health Survey. Moreover, women's lack of awareness of the complications of pregnancy was noted. By 2012 gaps were still observed; national statistics highlighted an increasing rate of low birth weight from 4.1% in 1980 to 9.5% in 2012 (*2*). The abortion ratio per 1000 live births has been fluctuating, with a slow decrease from 150 in 1995 to 134 in 2012. Moreover, the proportion of caesarean sections out of all deliveries undertaken in health facilities increased from 5.1% in 1990 to 17.5% in 2012,

while the emergency/elective caesarean section ratio decreased from about 6 to only 3.5. Although anaemia among pregnant women decreased from 42.8% in 2000 (*4*) to 26.7% in 2012, the rate is still high (*2*). In addition, other forms of morbidity associated with pregnancy have increased, e.g. diabetes to reach 4.8% and hypertension 1.1%.

Studying the predictors of ANC utilization can help to ensure adequate use of high-quality ANC and further reduction of maternal and child morbidity and mortality. Several studies have found that mothers' sociodemographic factors affect the adequacy of ANC utilization (*6–8*). A systematic review in developing countries (including only one Arab country) noted that adequacy of ANC utilization cannot be achieved merely by establishing health centres; women's overall social, political and economic status needs to be considered (*9*). For better evaluation of the adequacy of ANC, valid indicators are needed. Unfortunately, there is no consensus on the parameters to use for evaluation of the adequacy of ANC use. Most commonly studies include the number of ANC visits (4+) and timing of first ANC visit (1st trimester) (*6–8,10*). However, in addition to these, core services performed at least once during pregnancy (*8*), the provider of ANC and the place of delivery have been included into the process of evaluation (*11*).

As far as we know, no research has been conducted in Oman to study the adequacy of ANC utilization and its predictors in order to help policymakers in the MoH to adapt their policies and strategies regarding maternal health services. A good opportunity was to utilize data obtained from the 2008 RHS, the most recent community survey conducted in Oman to study these predictors. The aims of this study were to explore the adequacy of ANC using the dataset of the RHS and to determine the sociodemographic characteristics of Omani ever-married women (15–49

years)and health service factors associated with adequacy of ANC utilization.

Methods

Study design

This study was a secondary, in-depth analysis of data extracted from the national RHS in Oman, which was a cross-sectional national household survey conducted in the first half of 2008 (*5*). This survey was a part of the Oman segment of the World Health Survey, which was developed by the World Health Organization to obtain comprehensive information on the health of populations using standardized methodology.

Population and sampling

A probability, multistage, stratified cluster sampling was used in the national household survey to select 5000 families from all regions/governorates. The sample was stratified by urban/rural residence with equal proportions across the regions. All eligible, ever-married women aged 15–49 years from each selected household were interviewed at home. Out of 3944 eligible women interviewed, records of Omani women having children less than 3 years old (N = 1852) were selected for this secondary data analysis. Details of the study methodology have been published in detail elsewhere (*12*).

Data collection

Data were obtained through household interviews using a structured questionnaire and included sociodemographic variables such as women's age, place of residence, educational level, economic status and work status; health service factors such as access time to health facilities (time spent to reach the health facility), type of services (government or private) and patient satisfaction with health services; and ANC variables (outcome variables): number of ANC visits, timing of 1st ANC visit, ANC

provider and ANC contents (blood pressure measured, blood and urine samples taken, having ultrasonography scan and being told about signs of pregnancy complications).

Definitions

In this secondary analysis, adequate use of ANC was defined according to Abd El Hamid et al. (*11*) (with some modifications) using 3 indicators: adequate number of ANC visits (at least 4 ANC visits), early ANC use (1st ANC booking during 1st trimester) and ANC provided by skilled provider (doctor or nurse/midwife). Sufficiency of ANC was considered if all ANC contents were performed at least once during pregnancy. The score of overall adequacy of ANC was composed of 8 items: adequate ANC visits, early ANC use, ANC provided by a skilled provider, blood pressure measured, blood sample taken, urine sample taken, ultrasound performed and told about complications of pregnancy. So if a woman scored 8, she was classified as having adequate overall adequacy of ANC, if < 8 she was classified as having inadequate overall adequacy of ANC (*13*).

Ethical considerations

The Ministry of Health's research and ethics review and approval committee approved the proposal for secondary analysis of data of the RHS. The anonymity of the participants was preserved as they were not identified from the saved data records.

Data management

Data were entered to the computer using the *CSPro* and were cleaned using 2 syntax programs (*CSPro* and *Stata*). Sample weights were used to ensure the representativeness of the population. Analysis was done using the statistical package *SPSS*, version 18. Chi-squared tests and odds ratio calculations were used to test the associations between independent variables of interest (sociodemographic and health service

factors) and the dependent variables (adequate use of ANC, sufficiency of ANC and overall adequacy of ANC). Logistic regression and adjusted odds ratios (OR) with 95% confidence interval (CI) were used to identify the significant predictors independently.

Results

Sociodemographic characteristics of women

According to Table 1, 56.8% of surveyed women were in the age group 25–34 years old and 71.5% were from urban areas. One-fifth of women (21.6%) were pregnant with their 1st-order baby and 37.1% with their 5th or higher order baby in the 3 years preceding the survey. Approximately half of the sample (49.0%) had not completed secondary education and 15.8% and 20.4% were from the low and the lower-middle socioeconomic classes respectively; the majority of surveyed women (80.8%) had never worked. The majority of women were using public health facilities (71.9%) and were satisfied with the provided services (91.4%); 88.0% of them reported that the access time to health facility was 30 minutes or less. There was a discrepancy between urban and rural areas regarding the ANC provider; while in urban areas 74.6% of women received ANC by a doctor, in rural areas it was 59.7% (data not shown).

Predictors of components of adequate use of ANC

Table 1 also shows that the total percentages of women who had an adequate number of ANC visits and attended ANC early were 96.8% and 74.9% respectively. Almost all surveyed women (99.1%) received ANC from a skilled provider. The percentages of women who had an adequate number of ANC visits and attended ANC early were significantly higher with the 1st baby compared with the 2nd or

higher-order babies ($P = 0.045$ and < 0.001 respectively). Women aged < 25 years reported significantly higher rates of early ANC attendance compared with older women ($P = 0.001$). Other sociodemographic factors did not affect the adequate number of ANC visits or early ANC use. In addition, women's age did not affect the adequate number of ANC visits. Being in a high socioeconomic class was the only significant factor associated with receiving ANC from a skilled provider ($P = 0.017$).

With regard to content of ANC visits, almost all of the surveyed women recalled that blood pressure was measured, and blood and urine samples were taken (> 99%) and ultrasonography was done (> 95%). However, fewer surveyed women (72.2%) reported that they had been counselled about the danger signs of pregnancy.

Predictors of adequacy, sufficiency and overall adequacy of ANC utilization

The percentages of women who had adequate use of ANC (including adequate number of ANC visits, early use of ANC and ANC provided by skilled provider) and sufficiency of ANC (including performing all ANC contents) were 73.4% and 71.7% respectively. The overall adequacy of ANC (including both adequate use and sufficiency of ANC) in the surveyed women was 53.8% (Table 2). Women aged < 25 years (81.1%, P < 0.001) and those with 1st-order baby (84.4%, P < 0.001) were more likely to have adequate use of ANC (Table 2). Regarding sufficiency of ANC, women aged < 25 years (79.9%), having their 1st baby (80.1%) and those who were satisfied with the ANC service (75.1%) were more likely to have sufficiency of ANC components (P < 0.001, < 0.001 and 0.013 respectively). Table 2 also shows that the overall adequacy of ANC use was significantly affected by being < 25 years old (65.6%) (P < 0.001), having 1st baby (68.5%) (P < 0.001) and being

Table 1 Distribution of surveyed women by sociodemographic and health service factors and percentages positive for indicators of antenatal care (ANC) utilization

Variable	All women (unweighted)		Adequate number of ANC visits[a,d]	Early use of ANC[b,d]	Skilled provider of ANC[c,d]
	No.	%	%	%	%
Woman's age (years)					
< 25	430	17.2	98.0	83.5***	98.3
25–34	1175	56.8	96.7	74.1	99.0
35+	547	26.0	96.3	70.7	99.6
Birth order					
1	468	21.6	98.7*	85.9***	98.8
2–4	868	41.3	97.5	75.2	98.4
5+	816	37.1	95.5	69.6	99.6
Place of residence					
Urban	1123	71.5	96.7	75.7	99.0
Rural	1029	28.5	97.0	72.6	99.3
Educational level					
Illiterate	350	9.5	94.6	67.7	97.0
Literate/primary/ preparatory	936	39.5	96.8	74.2	99.3
Secondary	635	34.7	97.4	77.5	99.0
University+	231	16.3	96.9	75.0	99.8
Economic status					
Low	373	15.8	96.2	76.6	98.0*
Lower middle	483	20.4	98.8	71.6	99.1
Upper middle	556	29.0	96.2	74.9	98.6
High	624	34.8	97.0	75.9	99.8
Work status [e]					
Currently work	63	12.6	99.2	78.7	98.8
Previously worked	26	6.6	100.0	87.0	100.0
Never worked	503	80.8	97.5	74.8	99.5
Type of health facility [e]					
Private	92	28.1	100.0	72.2	61.4
Public	293	71.9	97.0	76.3	70.7
Access time to health facility (min) [e]					
≤ 30	307	88.2	97.5	74.4	67.1
> 30	61	11.8	100.0	79.5	68.4
Satisfaction with outpatient care					
Not satisfied	33	8.6	92.2	61.5	76.7
Satisfied	352	91.4	98.4	76.4	67.3
Total [f]	2152	100.0	96.8	74.9	99.1

[a]Adequate number of ANC visits = 4+ ANC visits; [b]Early use of ANC = 1st antenatal visit in 1st trimester; [c]Skilled provider of ANC = care received from doctor or nurse/midwife.
[d]Row percentages; [e]Only those who attended health facilities during the previous 12 months; [f]Totals not always the same due to missing data in some variables.
*P < 0.05; ***P < 0.001.

satisfied with the ANC service (60.8%) (P = 0.007).

Table 3 shows the final logistic regression model for selected predictor factors associated with adequate use, sufficiency and overall adequacy of ANC. Birth order [1st-order baby (OR 2.7; 95% CI: 1.7–4.1; P < 0.001) or having 2nd- to 4th-order baby (OR 1.5; 95% CI: 1.1–2.0; P = 0.015)] were the only significant predictors for adequate use of ANC. Also, birth order, particularly having 1st baby was the only significant predictor for overall adequacy of ANC (OR 2.2; 95% CI: 1.6–3.2; P <

0.001). However, in addition to having 1st baby (OR 1.8; 95% CI: 1.2–2.7; P = 0.006), being from low or lower-middle socioeconomic class (OR 1.3; 95% CI: 1.1–1.6; P = 0.019) were significant predictors for sufficiency of ANC.

Discussion

This secondary analysis revealed that the percentage of women having an adequate number of ANC visits in Oman was comparable to or higher than some other countries of the Gulf Co-operation Council and higher than other countries in the Eastern Mediterranean Region. Being pregnant with the 1st baby was the only significant predictor for adequate use of ANC, sufficiency of ANC and overall adequacy of ANC visit (including both adequate use of ANC *and* sufficiency of ANC). This survey showed that almost all of the studied women had 4 or more ANC visits (96.8%), and this was higher than percentages reported in the Oman *Annual health report* during the period between 2008 and 2012 (80.4–89.2%) (*2*). This discrepancy between the *Annual health report* and our results may be because the survey was more comprehensive in terms of including mothers who received ANC in MoH health facilities in addition to those using other government and private services. The antenatal coverage in this survey was comparable with that in Bahrain (100% during the period 2005–12), but was higher than in Qatar (85% during the period 2005–12) (*14*). This percentage was also much higher than that reported in some Middle East countries: 69% in Tunisia, 58.1% in Syrian Arab Republic, 48.4% in Algeria, 44.5% in Morocco and 29.3% in Yemen (*11*).

Three-quarters of women in this survey made ANC visits in the 1st trimester and this proportion was comparable to those of some countries in the Pan Arab Family Health Survey such as the Syrian Arab Republic (78.6%), Algeria (74.8%) and Morocco (79.1%). However, it was lower than others such as Tunisia (86.6%) (*11*). One-quarter of the women had late 1st antenatal visits and consequently might be at risk of having babies with neural-tube defects due to the lack of early intake of folic acid. Lack of awareness of the importance of early ANC might be the cause of late antenatal 1st visits.

Counselling about the danger signs of pregnancy was reported by approximately three-quarters of the sample and this was higher than in other studies, such as in Tanzania, where fewer than half of the pregnancy danger signs were recalled by clients (*15*). Lower rates of counselling compared with other aspects of ANC may be due to lack of communication skills by some healthcare providers or to overloaded clinics.

The effect of mother's age on adequacy of number of ANC visits is inconsistent across the literature. A study in Bangladesh found that lower age was a determinant for adequate number of ANC visits (*16*), while in another study, in India, higher age of mothers was associated with adequate number of ANC visits (*17*). In our study, as in other studies from certain parts of India and Egypt (*18,19*), the mother's age was not a determining factor for adequate number of ANC visits.

Lower age of the mother was a determining factor for early ANC use. Similarly, Bashour et al. in the Syrian Arab Republic found that mothers being younger (< 20 years old) correlated with early attendance at ANC (*6*). In contrast, age was not a significant factor for early ANC attendance in Myanmar in south-east Asia, perhaps because a narrower age range was studied (15–24 years old) (*20*).

In our survey, a significant association was found between being pregnant with the 1st baby and having an adequate number of ANC visits or early use of ANC. These associations were also observed in studies from Egypt, Syrian Arab Republic, Kenya and India (*6,19,21,22*). Other sociodemographic factors in our study, such as mother's education, socioeconomic status, residence and work status were not associated with adequate number of ANC visits and early use of ANC. In contrast, other studies found a positive association between these factors and adequate number of ANC visits and early use of ANC (*6,19,21,22*). The discrepancy between our study and others could be due to the high commitment by the government of Oman to explicitly implement the Health for All strategy through PHC in its 6th 5-year plan. The Government has not only declared that health is a fundamental right but has also provided public health services free of charge and given priority to construction of a basic health infrastructure that would be universally accessible to the whole population (*3,23*).

Using a single indicator—i.e. number of ANC visits *or* the timing of ANC visits *or* providing of ANC by skilled provider *or* content of ANC (sufficiency)—reflect only certain aspects of ANC. Although use of a single indicator can help to identify specific gaps in care, it may overestimate ANC utilization. In the present study, the percentages of women who reported positive for a single indicator were 96.8% for adequate number of ANC visits, 74.9% for early ANC use, 99.1% for ANC by skilled provider and 71.7% for sufficiency of ANC. Similarly, Trinh et al. in certain areas of Viet Nam found that using a single indicator—i.e. any use of ANC *or* duration of pregnancy at entry to ANC *or* number of ANC visits—gave overestimates of ANC use compared with overall adequacy when multiple aspects of ANC utilization indicators were combined (*13*).

In contrast, using a combination of factors—i.e. adequate use of ANC (number of ANC visits, timing of ANC visits *and* providing ANC by skilled provider) or overall adequacy of ANC

Table 2 Distribution of surveyed women according to antenatal care (ANC) utilization (adequacy and sufficiency) by sociodemographic and health service factors

Variable	All women (weighted)	Adequate use of ANC[a,d]	Sufficiency of ANC[b,d]	Overall adequacy of ANC[c,d]
	No.	%	%	%
Woman's age (years) (n = 1851)				
< 25	318	81.1***	79.9***	65.6***
25–34	1051	72.8	68.7	50.9
35+	482	69.5	72.7	52.2
Birth order (n = 1852)				
1	400	84.4***	80.1***	68.5***
2–4	575	74.0	69.4	51.3
5+	877	68.0	69.4	48.7
Place of residence (n = 1852)				
Urban	1323	74.4	71.9	54.6
Rural	529	70.8	71.3	51.8
Educational level (n = 1852)				
Illiterate	178	65.9	74.0	50.3
Literate/ primary/ preparatory	731	73.0	71.7	53.2
Secondary	642	75.3	73.7	57.0
University+	301	74.7	66.0	50.4
Economic status (n = 1762)				
Low	279	73.2	76.6	58.1
Lower middle	359	70.8	72.1	50.9
Upper middle	511	73.6	69.5	53.3
High	613	74.8	70.0	52.7
Work status (n = 461)				
Currently work	58	77.5	76.0	59.8
Previously worked	30	87.0	77.2	75.6
Never worked	373	73.6	72.0	56.2
Type of health facility[e] (n = 313)				
Private	88	72.2	75.6	56.4
Public	225	75.1	72.2	59.0
Access time to health facility (min)[e] (n = 305)				
≤ 30	269	73.4	73.9	58.7
> 30	36	79.5	68.6	53.6
Satisfaction with outpatient care[e] (n = 313)				
Not satisfied	27	61.5	52.9*	31.6**
Satisfied	286	75.5	75.1	60.8
Total	1852	73.4	71.7	53.8

[a]*Adequate use of ANC = all 3 indicators present; [b]Sufficiency of ANC = all ANC contents performed; [c]Overall adequacy of ANC = sum of adequate use and sufficiency of service.*
[d]*Row percentages; [e]Only those who attended health facilities during the previous 12 months.*
*P < 0.05; **P < 0.01; ***P < 0.001.

(adequate use *and* sufficiency of ANC) reflects utilization of all recommended ANC services. In our study, the percentage of women who reported positive for adequate use of ANC were 73.4% and for overall adequacy was 53.8%. The overall adequacy of ANC use in our study was higher than that reported in the Syrian Arab Republic (27.7%), Tunisia (25.5%), Algeria (19%), Morocco (13%) and Yemen (5.2%) (*11*). Abd El Hamid et al.'s survey used indicators of adequate use in addition to delivery by skilled health-care providers, which is a natal and not an antenatal indicator. In our study, therefore, we used sufficiency (components of ANC visit) instead of delivery by skilled health-care

Table 3 Final multiple regression model of selected predictor factors associated with adequate use, sufficiency of service and overall adequacy of antenatal care (ANC)

Variable	Adequate use of ANC	Sufficiency of ANC service	Overall adequacy (adequacy & sufficiency of ANC)
	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Woman's age (years)			
< 25	0.9 (0.6–1.5)	1.1 (0.7–1.8)	0.7 (0.5–1.0)*
25–34	0.8 (0.7–1.2)	0.7 (0.6–1.0)*	0.9 (0.6–1.4)
35+ (Ref.)	1	1	1
Birth order			
1	2.7 (1.7–4.1)***	1.8 (1.2–2.7)**	2.2 (1.6–3.2)***
2–4	1.5 (1.1–2.0)*	1.0 (0.7–1.3)	1.1 (0.8–1.4)
5+ (Ref.)	1	1	1
Place of residence			
Urban	0.8 (0.7–1.1)	0.9 (0.7–1.1)	0.9 (0.7–1.1)
Rural (Ref.)	1	1	1
Educational level			
Illiterate/ literate	1.2 (0.9–1.5)	1.1 (0.8–1.4)	1.1 (0.9–1.4)
Secondary+	1	1	1
Economic status			
Low/ lower middle	0.9 (0.8–1.2)	1.3 (1.1–1.6)*	1.1 (0.9–1.4)
Upper middle/ high (Ref.)	1	1	1

***P < 0.001; **P < 0.01; *P < 0.05.
OR = odds ratio; CI = confidence interval.

providers in our calculation of overall adequacy (*11*).

In our study, we observed an association between lower birth order and both adequacy and overall adequacy of ANC and this was significant for the 1st baby. Similarly, other studies (albeit using different operational definitions of ANC adequacy) have shown that there was a negative association between parity or number of deliveries and adequacy of ANC (*7,24*). On the other hand, other studies found no relation between parity and adequacy of ANC (*25*). Inadequacy of ANC among high-parity women could be due to time management problems, negative attitudes resulting from previous pregnancies or knowledge and experience gained from previous pregnancies.

There were some limitations to this study. Some data were not covered in detail in the original RHS 2008 survey, such as health education provided,

vaccination of mother, supplementation, and sex and language of ANC providers. Recall bias could be another limitation; however, we tried to reduce this bias by including records of Omani women having only children less than 3 years old in this analysis.

Conclusions and recommendations

In conclusion, a high rate of adequate number of ANC visits by mothers was observed in Oman. However, early use of ANC and counselling of danger signs of pregnancy need more attention in education and awareness programmes for women. Using more than one indicator to accurately reflect the overall adequacy of ANC utilization by women is preferable to using a single indicator. Being pregnant with the 1st baby was the only predictor of overall adequacy of ANC after adjusting the

other confounding variables. Although the overall adequacy rate of ANC was higher than in other Eastern Mediterranean Region countries, more efforts are needed to increase this rate, especially for women with 2 or more babies. Identification of disadvantage groups in terms of poor quality of ANC utilization, and contributing factors, would be important to improve the quality of ANC use.

These findings will be of importance to policy-makers and programme managers. For example, a revision of the national strategy with introduction of the concept of multiple indicators (i.e. the overall adequacy of ANC) for evaluation of ANC can increase the effectiveness of the programme. Furthermore, health-care providers should target all women in educational intervention programme, regardless of educational or economic status, and emphasize early attendance at ANC and sufficiency of the content of ANC.

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