ORIGINAL STUDY

A Study of Fertility Patterns of Ever Married Women in Oman

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دراسة نماذج الخصوبة عند النساء العمانيات

الملخص: الهدف: إيجاد العلاقة بين معدلات الخصوبة الزوجية من جهة. ومستوى التعليم والعمر والتمدين (التحضر) من جهة أخرى . ومعرفة فيما إذا كانت الخصوبة الزوجية قد تغيّرتُ بين سنة 1994/ 95 (المرجع) وسنة 1999/2000. **الطريقة:** أخذت معطيات الدراسة من مسح صحة عُمان الوطني لسنة 2000. بيانات تأريخ الولادة كانت تستعمل لمعرفة أعمار وولادات النساء في الفترات من 1990 إلى 1994. ومن 1995 إلى 2000. **النتائج:** معدل الخصوبة الزوجي في 1999/2000 كان 7.12 ولادة. كانت معدلات سكان الريف والمدينة (8.07 و 6.75 على التوالي في 1999/ 2000) . أما معدلات الخصوبة لكل منهما في 1994/95 فكانت (8.65, 8.30 و9.69 على التوالي) وهي أعلى من معدلات سنة 1999/2000 لكلّ الأصناف. مما يشير إلى انخفاض في تلك المعدلات. كان التعليم من العوامل القوية المحددة في الخصوبة. **الخلاصة:** تُؤكّد هذه الدراسةِ أن تعليمَ المرأةِ كلما كان عاليا كلما كانت الخصوبة أقل . وان الخصوبة في انخفاض.

المفردات المفتاحية: معدل الخصوبة . الخصوبة الزوجية . تأريخ التناسل . عمر المرأة.

ABSTRACT *Objective:* To examine the relation between age, education, residence and fertility rate and change in fertility rate between 1994/95 and 1999/2000. *Methods:* The data for the study was extracted from the Oman National Health Survey, 2000. The birth histories data was used to extract data on woman years and births in the periods 1990 to 1994 and 1995 to 2000. *Results:* The marital fertility rate in 1999/2000 was 7.12 births. The rates for rural and urban dwellers were 8.07 and 6.75 respectively in 1999/2000. Corresponding rates in 1994/95 (8.65, 8.30 and 9.69 respectively) were significantly higher than those in 1999/2000 for all categories, indicating a reduction in rates. In both periods the higher the education level of the mother the lower her fertility. *Conclusion:* Education was a strong determinant of fertility. This study confirms that the higher the education of the woman the lower her fertility and that fertility is on the decline in Oman.

Keywords: Fertility rate, marital fertility, reproductive history, woman years

Oman is an Islamic country on the Arabian Peninsula in the Middle East. The population of Oman is about 2.5 million with the bulk concentrated in the north and the south of the country. Prior to 1970 there were only one small missionary hospital and a few clinics scattered over the country. Oman has witnessed great strides in development during the last thirty years. The hospital bed space grew from only 12 beds in 1970 to 5,200 beds and about 120 health centers in 2000. With the improvements in health care, infant mortality has decreased from 110 per 1000 in 1970 to 17 per 1000 in 2000.[1]

The 1993 census of Oman suggests a wide-based age pyramid, with the majority of the population under the age of 20. This large young population base is likely to herald a 'baby boom', and a doubling of the population in 14 years is expected.[2,3,4,5] As a response the Ministry of Health started to institute a number of birth spacing initiatives in the early 1990s.[1] Comprehensive studies are needed to appraise the effect of such programmes.

At the turn of this century, the population of the world surpassed 6.1 billion. This means that the number of people has more than doubled in the past 50 years. However, population growth has leveled off in most industrialized countries and in some countries has even begun to decline.[6,7] Although debilitating diseases such as malaria and acquired immune deficiency

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disease are likely to mitigate the current estimate of population growth,[8] the trend in developing countries, including Arab countries, suggests the existence of various factors favoring rapid population growth. Various studies have given conflicting reports on population growth in the Islamic world.[1,2,3,4,5,11,12,13,14] To our knowledge, no such studies have come out of Oman. In a paternalistic society such as Oman, women have traditionally played domestic and gender roles that are strongly associated with women's biological imperatives.[14,15] However, the recent acculturation and the spread of education in the country have ushered in new roles and opportunities for women.[16] Despite cultural constraints, women in Oman have infiltrated positions that were once considered male domains.[17] In education, females appear to be performing better than their male counterparts.[18] It is apparent that such newly found social status has impacted on fertility rates. Studies from developing countries suggest that education appears to be an antidote to high birth rates, since fertility is highly influenced by the level of education of women.[19,20] The relationship between education and fertility has yet to be clearly established in Oman. Previous studies have also suggested that there are significant differences between fertility in urban and rural areas in many developing countries.[21] Similar studies are needed to examine the fertility rate between rural and urban populations in Oman so that effective family planning strategies can be contemplated.

The aim of this paper is three-fold: (i) to examine the marital fertility rate, which is the general fertility rate for ever married women in Oman; (ii) to assess the impact of education and dwelling on fertility; and (iii) to examine whether the rate of fertility has changed over time.

DATA

The data for this study were derived from the Oman National Health Survey-2000 (NHS-2000), which Al-Riyami[22] conducted nationally from September 1999 to March 2000. The Oman National Health Survey was a comprehensive survey that generated information on, among other things, patterns and determinants of morbidity and mortality, reproductive health and the prevalence of some common diseases.

A multi-stage stratified probability-sampling plan was used to select respondents that covered the 10 regions of Oman. Suleiman et al.[1] reported the details of the design. The Ministry of Health of Oman con-

ducted the NHS-2000 with support from UNICEF and UNFPA. A questionnaire administered by trained personnel was used in collecting the various pieces of information. Some parts of the questionnaire were filled from documents provided by respondents. The reproductive health questionnaire consisted of six modules – a woman's background, reproductive history, maternal health, family planning knowledge, social status and AIDS awareness. The reproduction module on which the current article was based obtained information on the number of children and the dates of birth of all children ever born. For the present analysis the relevant variables from that survey included the date of birth, age, dwelling and level of education. This study focused on only ever-married Omani women and hence the rates discussed in this article are called marital fertility rates, which are in effect the general fertility rates for ever-married women. In Oman 37% of all women are single, 52% are married and about 3% are divorced (NHS-2000). Over 84% of all women in the age group 25 to 49 are married, while 8% of women between 15 and 19 are married.

Since the database contained the birth dates of all children ever born to the women, two secondary data sets were generated; the first, called 1999/2000 data, used the actual interview date as the reference date in computing the number of children and woman years. The second data set, called 1994/95 data, assumed a hypothetical survey date that was five years earlier than the actual interview as the reference date. Women who were 15 to 49 in 1999/2000 were 10 to 44 in 1994/95. Therefore to compare the same set of cohorts in 1994/95 with similar cohorts in 1999/2000, only women who were 20 – 49 during the interview in 1999/2000 were included in that part of the computations [Tables 5 and 6]. Besides, women who had died between 1994/95 and 1999/2000 were not included in the 1994/95 data, though they would have been included if the interview had actually taken place then. Excluded also from the 1994/95 computations were all women who were married between 1994/95 and 1999/2000 as they were not married before the hypothetical interview in 1994/95. That is, data on 15-49 year olds in 1999/2000 were used in computing the estimates reported in Tables 3 and 4, while 15 to 44-year olds in 1999/2000 were used for estimates reported in Tables 5 and 6.

The data were analyzed using the statistical package StatXact. Nonparametric ANOVA was used to

Table 1: *Sample data from birth histories of 5 women*

	Years from interview date						
	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Woman 1	25	(24)	23	(22)	21	20	[19]
Woman 2	22	21	[20]				
Woman 3	23	22	21	20	19	[18]	
Woman 4	(24)	23	22	(21)	[20]		
Woman 5	24	(23)	[22]				

NB: (23) indicates birth at age 23, [20] indicates marriage at 20

compare the rates.

METHOD OF ESTIMATING FERTILITY RATES

The marital fertility rate, MFR, is computed using the method described in the next section. Readers are referred to Schmertmann and Caetano[23] for more details. Since there may be only one data set for the estimations the degree of accuracy of the estimate is usually not possible to determine. Bootstrap[24] methods were used to compute the 95% confidence bounds for the estimates of the fertility rates. Note that these bounds are not symmetric about the mean as normality was not assumed.

3.1 Estimation of fertility by last T woman-years method

Suppose X is the number of years between the time of marriage and the interview date for a particular woman, that is, X = interview date − marriage date. This woman will be deemed to be susceptible to having a child in these X+1 years. In this conservative society, sexual activity usually starts at marriage. Assuming a truncation time of T years, this woman would contribute Z equal to minimum (X+1, T) woman years of susceptibility to child bearing. If this woman was Y years old at the time of the survey then these Z woman years of susceptibility are distributed one woman year each for the years Y, Y-1, Y-2,-Y-Z. In addition, if this woman had provided k births during the Z years, these births would be counted against the particular years. For example, consider a woman 25 years old at the time of the survey that was married at age 19 and had births at ages 22 and 24. She would provide one woman-year of susceptibility to each of ages 19, 20, 21, 23 and 25 and provide a birth and a woman year to each of the ages 22 and 24 (W1, Tables 1 and 2). Another woman (W2) who was married at 20 and had no children by age 22, when she was interviewed, would contribute only 3 woman years. See Tables 1 and 2 for more illustrations.

The estimator of the fertility rate for a particular year is the number or sum of births in that year divided by the number or sum of all woman years for that age [Table 2]. In this formulation a decision needs

Table 2: *Distribution of woman years by age at risk for 5 women, T=5*

Age at Risk	W1	W2	W3	W4	W5	Total Births at Age	Woman Years	Rate
18			[1]*			0	0	0
19	[1]*		1	[1]*		0	1	0/1
20	1*	[1]	1	1		0	3	0/3
21	1	1	1	(1)		1	4	1/4
22	(1)	1	1	1	[1]	1	5	1/5
23	1		1	1	(1)	1	4	1/4
24	(1)			(1)	1	2	3	2/3
25	1					0	1	0/1
								1.37

NB: (1) indicates a woman year and a birth.

1 indicates one woman year.

[1] indicates marriage year and a woman year;

* indicates the year is not contributed because of truncation

to be made on how far back (T years) from the interview date to truncate the data. If T=1 is used then the method is equivalent to the "birth last year" method.[23] The truncation time, T, equal to 5 years, is usually taken since it is not too far from the interview date to make the results outdated. The fertility rate of any group is obtained as the sum of the ratio of number of births to number of woman years over the individual years/ages. For example the fertility rate of these five women will be 1.37.

RESULTS

The women in this data set were between 14 and 49 years old. Their average age was 31 years with a standard deviation of 7.8 years. Seventy-three percent lived in the urban areas while 23% lived in the rural areas. On average the women in this sample were married by age 17 years and the average number of children born was 5.

MARITAL FERTILITY RATES IN OMAN, 1999/2000 INTERVIEW DATE DATA

Table 3 shows the estimates of the marital fertility rates of Omani women aged 15 to 49 years by categories. The marital fertility rate (MFR) based on the 1999/2000 survey date was 7.12. The 95% confidence interval was (6.90, 7.37). Obermeryer[14] reported that between 1950 and 1990 Oman had a constant total fertility rate of 7.2. According to a recent report the total fertility rate has declined to 4.8 in 2000 (NHS-2000). Note that the marital fertility rate is the total fertility rate for only married women as the base group. Hence it is expected that the marital fertility rate will be higher than the total fertility rate. There was a marked difference between the MFR for the rural dwellers and the urban dwellers (p-value<0.01). The rate for the rural dwellers was 1.3 births more than that of the urban dwellers. Education also had a marked effect on the fertility rates (p-value<0.01). The more educaction Omani women achieved the lower the rates. The college or university educated had a rate of 4.75 births while the lowest educated achieved a rate of almost 8 births.

MARITAL FERTILITY RATES IN OMAN, ASSUMING 1994/95 INTERVIEW DATE

Assuming a 1994/95-interview date the marital fertility rate for Oman was 8.65 with 95% confidence limits (8.36, 8.95) [Table 4]. The fertility rate was higher in the rural areas than in the urban areas. The rates were 9.69 in the rural areas compared to 8.30 in the urban areas. As in 1999/2000 results, education had an inverse relationship with fertility. The difference between the rates for the no-education group of women and the college or university educated women was 4.3 births. The rates in 1994/95 were higher than the corresponding rates in 1999/2000.

COMPARISON OF FERTILITY RATES FOR 1994/95 AND 1999/2000

Table 5 gives the fertility rates in 1994/95 compared with those in 1999/2000. It should be noted that only women who were between 20 and 49 during the 1999/2000 interviews were used for the computations for the 1994/95 estimates while the estimates for 1999/2000 were restricted to women who were between 15 and 44 years old, in order that the same groups could be compared. For Oman as a whole, the fertility rate reduced by about 1.8 births, from 8.65 in 1994/95 to 6.86 in 1999/2000. There was a reduction for all age cohorts. There was a drop of almost two births in the urban areas and 1.6 in the rural areas in this time interval. The standardized fertility ratios in the

Table 3: *Bootstrap estimates of marital fertility using data on 15-49 year olds in 1999/2000*

	Sample size	No. of births up to T=5	No. of woman years	Estimate of fertility	95% Lower Confidence Limit	95% Upper Confidence Limit
Oman	2037	2338	9482	7.12	6.90	7.37
Urban	1492	1612	6934	6.75	6.47	7.01
Rural	545	726	2548	8.07	7.60	8.48
No Education	747	817	3703	7.70	7.22	8.22
Up to Primary	680	843	3221	7.03	6.65	7.45
Prep-Secondary	488	547	2037	6.17	5.68	6.82
College-University	122	131	521	4.75	4.06	5.49

Table 4: *Bootstrap estimates of marital fertility using data on 15-44 year olds in 1994/95*

	Sample size	No. of births up to T=5	No. of woman years	Estimate of fertility	95% Lower Confidence Limit	95% Upper Confidence Limit
Oman	1675	2499	7598	8.65	8.36	8.95
Urban	1224	1778	5579	8.30	7.97	8.64
Rural	451	721	2019	9.69	9.07	10.26
No Education	729	1205	3558	9.54	9.10	10.01
Up to Primary	594	920	2689	9.25	8.11	10.24
Prep-Secondary	280	304	1084	5.71	5.17	6.26
College-University	72	70	267	5.25	4.32	6.37

last column of the table, quantified the general reductions in the rates from 1994/95 to 1999/2000.[25] All the education categories showed big drops in rates. The education classification in 1999/2000 was retained for their status in 1994/95 since this classification was not available for the 1994/95 data. Table 6 shows the rates by age cohorts. Again all categories experienced decreases in the fertility rates. The biggest drops were in the 35-44 cohorts.

DISCUSSION

Studies of fertility from different parts of the Arab world suggest that since the late 1970s there has been a steady decline in fertility.[26] However, such decline is not uniform.[26,27,28,29,30,31] In Yemen, where women begin childbearing at a relatively early age and a large proportion of ever-married women reach high parity at a relatively fast pace, the fertility rate exceeds seven children per woman of reproductive age.[23] In contrast, in North Africa women are characterized by delays in the onset of and a slow pace of childbearing; and a smaller proportion of ever-married women reach high parity with a fertility rate of less than 5 births per woman.[23] While a woman's fertility has been suggested to be inversely related to her level of education,[20] this issue has so far not been sufficiently investigated in the Arab world[32]. The present data suggest that in Oman the higher the education of a woman, the lower the fertility rate, which tend to agree with similar studies cited earlier. This largely supports previous studies that empowerment of women with education is a strong catalyst for a successful campaign for health related matters.[26]

The high fertility rates in developing countries place heavy financial burdens on families with the resultant negative effect on economic growth and quality of life.

Table 5: *Estimates of Age Specific Fertility Rates for Oman for 1994/95 and 1999/2000 and the corresponding Standardized Fertility Ratios*

	1994/95			1999/2000			Standardized Fertility Ratio with 1994/95 as base year
	No. of births	Woman Years	Marital Fertility	No. of births	Woman Years	Marital Fertility	
Oman	2499	7598	8.65	2288	8882	6.86	0.80
Urban	1778	5579	8.30	1574	6469	6.44	0.79
Rural	721	2019	9.69	714	2413	8.13	0.84
No Education	1205	3558	9.54	773	3193	7.42	0.78
Up to Primary	920	2689	9.25	838	3161	6.76	0.81
Prep-Secondary	304	1084	5.71	546	2017	6.21	0.94
College-University	70	267	5.25	131	511	4.75	0.91

NB: Educational status as at 1999/2000 used for 1994/95 classification

Table 6: *Estimates of Age Specific Fertility Rates for Oman for 1994/95 and 1999/2000 and the corresponding Standardized Fertility Ratios by cohorts*

Cohorts	1994/95			1999/2000			Standardized Fertility Ratio with 1994/95 as base year
	No. of births	Woman Years	Marital Fertility	No. of births	Woman Years	Marital Fertility	
15-19	362	1125	1.47	198	739	1.17	0.78
20-24	686	1874	1.83	655	1991	1.64	0.90
25-29	660	1855	1.78	624	2123	1.47	0.83
30-34	511	1582	1.60	471	1881	1.25	0.78
35-39	226	881	1.26	280	1586	0.87	0.69
40-44	54	281	0.71	60	562	0.46	0.57

Like elsewhere, Oman has traditionally had high fertility rates under the impression that some children may not survive into adulthood.[2,33] With very limited or almost non-existent medical services prior to 1970, mortality rates, both for mother and child, were very high in Oman. However with improved medical facilities after 1970 and the resultant increase in life expectancy, coupled with high fertility, population growth increased rapidly.[3] Children are also perceived as gifts from God, and this perception might also encourage high fertility. This could entail difficulties in employment provision, infrastructure development and service delivery, particularly in education and health.[34,35]

The above explains to some extent the high fertility rates reported in this study. However there are indications that the rates are decreasing. The standardized fertility ratios indicated a general decrease from 1994/95 to 1999/2000 within all cohorts. The older women had higher decreases. Although this should be a welcome beginning, more concerted effort is needed to target women who are not yet benefiting from modern education. As family planning is sometimes viewed with suspicion in many traditional societies,[36] its implementation needs to be handled with cultural sensitivity and skill for it to be acceptable. The current emphasis of family planning programs should be on educating families to increase the intervals between births rather than focus on reducing the number of children. This apparently is more compatible with socio-cultural teaching especially in the Middle East. For such programs to work, less educated women will have to be especially targeted, as these are the groups with the highest fertility rates.

LIMITATIONS OF THE STUDY

Some limitations associated with the data analyzed in this paper have potential implications on the interpretation of the findings. A common problem with retrospective studies is the reliability of recall.[37] The older women may not be able to remember accurately information related to the birth of older children. Secondly, this study hinges on the idea that there is a clear dichotomy between urban and rural areas, both socially and geographically. In Oman the urban-rural divide is not very clear. Most urban dwellers have very strong ties with the rural areas, which they visit almost on a weekly basis. Also many urban residents tend to marry from the rural areas. This notwithstanding, the present data show that there are discernible differences in fertility rates between rural and urban areas in Oman. Thirdly, the term education tends to pose difficulties in the Arab/Islamic world where many individuals do receive a traditional education known as 'madrasa', leading to a literacy or at least cursory knowledge of the Koran.[38] However, information about whether the present cohort acquired a *madrasa* education was not elicited. In addition, the level of education as elicited from the present sample is likely to have missed other important variables such as quality and skills acquisition. Future studies ought to explore the contribution of traditional education and other skills to fertility.

This study has explored the relationship between marital fertility rates and the level of education, age and urbanization, and assessed whether the rate of fertility has changed over time. In general the fertility rates were high but a decline was noted since the rates in 1994/95 were significantly higher than the rates in 1999/2000. Despite these caveats, the impact of educa-

tion, age and urbanization on fertility rates were found to be significant.

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