derived from a dataset of 50 subjects of whom 10 had the disease in question. Further guidelines for the evaluation of decision rules are provided in reference 7.

Rules for interpreting diagnostic literature are given in Table V.[14,15] It is useful to remember that the following principles apply to all medical literature: (*i*) is the study valid?; (*ii*) what are the results and their level of precision?; (*iii*) can I apply these results in my practice?

Diagnostic research is still in its infancy and the clinician can look forward to better ways of overcoming uncertainty regarding ruling disease in or out. However, it is imperative that the clinician understands and applies the principles related to diagnostic research and reasoning in order to ensure optimal patient management.

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PREVALENCE OF PRE-CANCEROUS LESIONS AND CERVICAL CANCER IN SOUTH AFRICA — A MULTICENTRE STUDY

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Objectives. To describe the age-specific prevalence rates of cancer of the cervix in South African women presenting for screening.

Design. A multicentre prevalence survey in 10 geographically defined areas following a common core protocol. Services were located in existing service sites, with the exception of KwaZulu-Natal which used a mobile service. Women aged 20 years and above were eligible for inclusion.

Outcome measures. Age-specific cervical cytologically diagnosed abnormality rates according to the Bethesda classification.

Results. During the study 20 603 women participated. Eighty per cent of the sample had never had a Pap smear before and just over 91% had not had a Pap smear in the last 5 years. In

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this study population 468 women screened (2.42%) were found to have low-grade squamous intra-epithelial lesions (LSIL) and the average age of these women was 33.1 years; 366 (1.8%) had high-grade SIL (HSIL) and these women were statistically significantly older at 37.97 years of age; and 92 women (0.47%) were found to have cytologically diagnosed invasive cancer. These women were significantly older, with an average age of 51.3 years. A clear relationship was found between age and LSIL, with younger women having a high rate of LSIL which decreases with increasing age. A similar but inverse relationship between age and invasive cancer is described, with the rate being low in young women and increasing with increasing age. A clear relationship between HSIL and age is not described in these data. The adequacy rate (satisfactory and satisfactory but limited) of the slides was 95%, and just under 92% of the study sample received their results. Not all women were appropriately referred and it was not possible to assess if women referred for treatment received it.

Conclusions. These data indicate that cancer of the cervix is a common disease and that, similar to other countries, it is a disease of older women. These data give some positive indicators for future screening — older women will present for screening and the majority of women received their results. However, improvements in health system functioning are needed. A uniform national cytology reporting system is required as well as clear guidelines for providers on what action to take based on cytology reports. Linkage between the site of screening and treatment centre is inadequate and requires urgent attention in order to decrease cervical cancer mortality.

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Cervical cancer is the most common cancer in South African women[1] and is one of the few cancers, perhaps the only one, where screening can identify pre-cancerous lesions, and where an association between screening and mortality decline has been demonstrated.[2,3] Mortality from cervical cancer has been decreasing in developed countries and this decrease has been faster and more sustained in countries with organised national screening programmes.[4,5] The call for a rational national screening programme for cervical cancer in South Africa has been made for at least the past 30 years.[6] While the cost effectiveness of cervical cancer screening has been demonstrated[7,8] there has nonetheless been debate about whether South African health care services are sufficiently developed to be able to sustain cervical cancer screening.[9-12]

Cervical cancer is a disease of older women.[13,14] South African Cancer Registry data indicate that in the age category 20 - 24 years approximately half a million women would have to be screened to find 1 case of cervical cancer, whereas in the age category 35 - 40 years, 4 000 women would have to be screened in order to identify 1 case of cervical cancer.[1] It is evident that the cost effectiveness of screening and the resource allocation and time that women would have to invest in order to impact on cervical cancer mortality are very significantly influenced by the age group screened. World Health Organisation (WHO) guidelines advise commencing screening approximately 'one to two years before the incidence of invasive disease reaches appreciable levels'.[15] The South African Department of Health, using best available data and taking into account resource constraints, has therefore approved a national screening policy to screen all women in South Africa over the age of 30 years.[16] Cancer registry data reflect histologically diagnosed cancer reported to the registry and in the 1993 - 1995 report doubts about cervical cancer incidence, which may be inappropriately low, are raised.[17] There has been concern among clinicians that cervical cancer occurs in younger women in South Africa; however, this has not been documented and may possibly reflect the profound impression that a young woman with cancer makes on a clinician. There are data to suggest that in HIV-positive women the disease may progress faster. However, it should be noted that while HIV-positive women with invasive disease appear to be about 10 years younger on average than HIV-negative women, their average age is nonetheless over 40 years[18] which is still 10 years older than the age at which the current policy proposes to begin screening.

In order to address the age-specific rates of cervical cancer a multicentre study was undertaken to determine the prevalence of cervical abnormalities, focusing on unscreened South African women aged 20 years and above.

The primary objective of the study was to determine the age-specific prevalence of cytological abnormalities in a population of South African women. In addition study data on the number of patients who received their results and whether appropriate action was taken provide some indication of the capacity of the health service to implement cervical screening services.

METHODS

Women 20 years and older, preferably those who had never had a Pap smear, but also those who had not had a Pap smear within the last 5 years, were eligible for inclusion. Pregnant women were not excluded. From least-likely estimates of cervical cancer prevalence 1 000 women per 5-year age category were required, starting at 20 - 24 years and extending to age 60 and above. In order to gain such a sample in a reasonable time period and to include women from all over South Africa, a multicentre population-based prevalence survey was undertaken. Following a common protocol each participating obstetrics and gynaecology department at six

universities chose a site, either because of a previous relationship with the area or because it was an under-served area. Each area was geographically circumscribed and within that geographical area women in the target population were informed, using various methods ranging from home visits to educational campaigns, about the study and encouraged to attend for a Pap smear. In order to simulate a screening programme maximally, existing services and service infrastructure were used. In some areas services were integrated into existing health care services provided by existing staff. Where this was not possible appropriately trained staff were specifically employed to take the Pap smears. In either circumstance women who were recruited attended existing health care facilities and for further care the usual referral mechanisms were used. Care of individuals with abnormalities was the responsibility of the principal researcher at each of the study sites. The exception to this method was in KwaZulu-Natal where a remote under-served rural area was chosen. A mobile clinic staffed by a gynaecologist travelled to the area to perform Pap smears and provide follow-up services as well as transporting women who required tertiary care.

At least one study site in each province was established and while these sites were not representative of the entire province, the study as a whole collected data from highly urbanised areas with formal housing, township and squatter areas, and peri-urban and rural areas. Thus the range of living circumstances in South Africa was represented in the total study sample. Each site used a standard data collection form. Pap smears were processed by the laboratory servicing the study area and a pre-agreed standardised interpretation and reporting system was used. Data were forwarded to a central data manager, coded, entered onto a mainframe computer and analysed using the Statistical Analysis System (SAS) package. Statistical consultancy was provided by the Department of Statistics and Actuarial Science at the University of the Witwatersrand and analysis was done by the Data Management and Statistical Analysis (DMSA) unit at the same university. Ethical approval for the study was obtained from the relevant university by each principal researcher and all participants completed a uniform written consent form.

Analysis

The descriptive data for the total study population and site-specific data are presented. Site-specific data are presented to describe the range of conditions and services across South Africa. Site-specific health system performance within each site is also presented for the same reason. In relation to cervical cancer prevalence the reliability of the results are determined by the sample size and only the pooled data provide sufficient numbers within each age category. Thus prevalence data for the entire study sample are presented. It should be noted that in North West there were two study sites and in the descriptive data these two sites are presented separately as North West and Hammanskraal. In other analysis they have been combined as North West.

When comparing rates between sites and in developing the projections for South Africa, age was standardised to the South African population. Province-specific projections of cervical abnormality have been created by applying the pooled rates to the province-specific ages.

In analysing the age trend normal and low-grade squamous intra-epithelial lesions (LSIL) were combined into one category and high-grade intra-epithelial lesions (HSIL) and invasive disease formed the other two categories. The reason for this was, as data indicate, that the majority of LSIL revert to normal,[19] while women with HSIL and invasive disease should be referred for immediate investigation and appropriate treatment. Women with LSIL should be followed up to assess their cervical health status.

Analysis investigating the correlation between descriptive variables and the outcome (cervical health) first focused on bivariate analysis. In these analyses cervical health was initially defined into the three categories described above: normal (combining normal and LSIL), HSIL, and invasive squamous carcinoma; and also into two categories: normal (combining normal and LSIL), and abnormal (combining HSIL and invasive disease). The trends obtained were similar using either categorisation and therefore for simplicity the rates using the two categories were employed to build a logistical regression model. All the variables thus found were included in a stepwise analysis which progressively excluded variables that were not statistically significant.

Results

Descriptive characteristics

During the study period 20 603 individuals had Pap smears; of this number 326 were excluded because they were not in the study age range or age data were missing. For 591 women no laboratory data were received because the data forms, cytological slides or laboratory reports were either lost or not returned in time to comply with the study cut-off date. These individuals were nonetheless included in the overall numbers of the study as they had presented for a Pap smear. The individual sites contributed different numbers of individuals to the study (Fig. 1) and differed in their age structure, with KwaZulu-Natal and Northern Province comprising older study samples and North West and Mpumalanga comprising the youngest study samples. Sites also differed in predictable ways, for example electricity and water in the home were more common in urban compared with rural sites. Besides the KwaZulu-Natal site, which had a lower average level of education (Std 2), the average highest educational level was

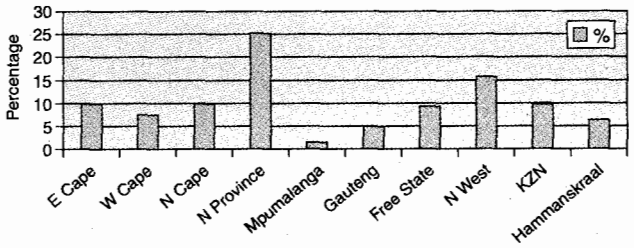

Fig. 1. Percentage contribution of each site to the study population.

similar across the sites (Std 5 - 6). While pregnant women were not excluded from the study, only 5.8% of the total study population were pregnant. This ranged from less than 1% to 7% between the sites, excluding the Western Cape where 19.6% of the sample were pregnant (data not presented). The sites also differed in terms of the percentage of women using contraception. Contraception use was higher in the sites with a younger average age and lower in the sites with an older average age. On average in this study population women had 2.9 children and the age of first intercourse was similar across the sites. The descriptive characteristics of the study population are presented in Table I.

Further descriptive data more specific to cervical health are presented in Table II. The proportion of women who reported never having had a Pap smear previously ranged from 29.5% in the Western Cape to 97.1% in North West. For the total population, 80% reported never having had a Pap smear previously and 92.1% of the total population reported not having had a Pap smear in the past 5 years.

Overall, 70.5% of the total population attended the health service specifically for a Pap smear, mostly in response to information from clinic staff or because of the advertising initiated as part of the research project (Table III). Almost half the study population (49.8%) reported having a vaginal discharge; this ranged from 38.8% in Northern Province to 99.2% in North West. On examination 37.5% of the women were described by the Pap smear takers as having a discharge (ranging from 17.3% in the Northern Cape to 94% in North West). It should be noted that in the North West site specially trained lay women did the interviews and took the Pap smears.

The source of information regarding the availability of screening was similar for all sites, predominantly clinic staff (47.5%) or adverts specifically about the study on the mass media (42.1%) (Table III). The major reason for coming for a Pap smear (again similar across all sites) was to ensure good health and exclude cancer (Table IV).

The smear was reported as satisfactory or unsatisfactory for interpretation by each of the participating laboratories. Initially a set of standard slides were circulated in an attempt to develop uniformity in reporting. Laboratories used the Bethesda classification, therefore slides were classified as satisfactory, satisfactory for evaluation but limited (either by

Table I. Descriptive characteristics of the population

Variable*	Total	Eastern Cape	Western Cape	Northern Cape	Northern Province	Mpuma-langa	Gauteng	Free State	North West	KwaZulu-Natal	Hammans-kraal
Age (yrs)	37.7	38.90	36.46	36.92	39.62	34.80	35.9	37.07	34.19	43.07	33.63
	(20 - 95)	(20 - 95)	(20 - 80)	(20 - 80)	(20 - 89)	(20 - 68)	(20 - 80)	(20 - 82)	(20 - 88)	(20 - 90)	(20 - 73)
	11.77	12.24	9.2	11.09	11.91	10.38	10.75	9.94	10.04	14.97	10.93
Gravidity	3.5	3.17	2.96	3.16	3.90	3.03	2.73	3.37	3.34	4.5	2.97
	(0 - 15)	(0 - 15)	(0 - 14)	(0 - 15)	(0 - 15)	(0 - 12)	(0 - 13)	(0 - 15)	(0 - 15)	(0 - 15)	(0 - 12)
	2.45	2.28	1.92	2.28	2.5	2.4	2.3	2.33	2.20	2.98	1.96
Parity	2.9	2.64	2.63	2.62	3.40	2.53	2.35	2.68	2.73	3.2	2.46
	(2 - 12)	(0 - 10)	(0 - 12)	(0 - 12)	(0 - 12)	(0 - 11)	(0 - 10)	(0 - 12)	(0 - 12)	(0 - 11)	(0 - 12)
	2.03	1.85	1.88	1.9	2.23	1.94	1.9	2.33	1.8	2.2	1.96
Age of coitarche (yrs)	17.8	17.90	18.10	18.40	18.07	17.49	17.42	17.55	17.54	17.7	16.73
	(7 - 32)	(9 - 32)	(11 - 32)	(9 - 31)	(7 - 32)	(11 - 28)	(10 - 26)	(11 - 30)	(10 - 29)	(10 - 30)	(11 - 28)
	2.52	2.7	2.9	2.7	2.5	2.3	2.3	2.43	2.04	2.5	2.14
Using contraception (%)	45	45	48.6	55.8	35	53	45.3	41.2	63.5	22.9	49.7
Electricity at home (%)	58.5	64	94	88.9	50.7	75.8	91.5	73.8	18.6	23.6	96.7
Running water in the house (%)	47.7	88	82.5	86.4	36.7	61.2	92.1	67.9	9.6	8.4	9.3
Highest educational level achieved (mean, SD)	Std 5 4.05	Std 6 3.7	Std 5 2.9	Std 5 3.67	Std 6 4.4	Std 6 2.3	Std 6 3.4	Std 5 3.3	Std 5 4.1	Std 2 4.1	Std 6 3.8

*Mean (range) SD, unless otherwise specified.

Table II. Cervical screening characteristics of the study population*

	Total	Eastern Cape	Western Cape	Northern Cape	Northern Province	Mpuma-langa	Gauteng	Free State	North West	KwaZulu-Natal	Hammans-kraal
Never had a Pap smear before (%)	80.6	67.7	29.4	50.8	91.7	82.6	86.6	84.5	97.1	95.3	93.4
No Pap smear in the last 5 years (%)	92.1	83.9	97.9	71.5	94.4	93.0	94.1	89.7	98.9	98.7	97.1
Came to service for a Pap smear specifically (%)	70.5	46.5	70.2	87.2	58.3	41.6	87.1	75.5	75.5	95.9	60.7
Report having a discharge (%)	49.8	58.3	41.9	44.9	38.8	53.2	52	73.9	99.2	94.1	50.9
Cervix visualised (%)	98.7	99.5	99.4	96.4	98.2	97.2	97.9	99.8	97.1	95.3	93.4
Discharge/ blood present (%)	37.5	46.5	92.7	17.3	47.5	63.4	66	39.1	94	70.1	81

* Data missing for 1 082 people.
†Not specific to the cervical smear result and often reflected a clinical condition such as a discharge.

Table III. Sources of information about screening availability*

Source	*N*	%
Clinic sister	9 435	47.5
Advert, campaign, radio	8 373	42.1
From a friend/neighbour	1 896	9.5
Knew anyway	46	0.2
Other	125	6

* Data missing for 399 people.

Table IV. Motivation for having a Pap smear*

	N	%
To confirm health/exclude cancer	16 593	86.4
Had current gynaecological problem	1 722	9
Part of routine antenatal service	340	1.8
Previous gynaecological problem	260	1.4
Never had one before	159	0.8
Hoped to get pregnant	64	0.3
Sexual dysfunction	55	0.3
Other	2	

* Data missing for 1 082 people.

blood, discharge or inadequate cellular component) or unsatisfactory for evaluation where no diagnosis could be made. Some laboratories noted slides as being unsatisfactory but the cytologist nonetheless gave a definitive report and therefore could in fact read the slide. In this study such slides have been reported as satisfactory for evaluation but limited. The overall data on slide satisfactory rates and the site-specific data are reported in Table V. Overall the satisfactory rate was high at 80.6% and 95% of smears were reported on (reflecting both the satisfactory and satisfactory but limited categories). Only 1.6% of slides were unreadable and had to be repeated.

In this study population 468 women screened (2.42%) were found to have LSIL and the average age of these women was 33.1 years (range 20 - 84 years); 366 women (1.9%) had HSIL and these women were statistically significantly older at 37.97 years of age (range 20 - 84 years); and 92 women (0.47%) were found to have cytologically diagnosed invasive cancer. The average age of women with invasive disease was 51.3 years (range 27 - 82 years), statistically significantly older than the rest of the sample. Statistical significance was determined using analysis of variance and multiple comparison *t*-tests, and a *P*-value of 0.0000 was used for all comparisons quoted.

Distribution of cervical abnormality (number and percentage) by age category is presented in Table VI. There is a clear relationship between age and LSIL, with younger women having a high rate of LSIL which decreases with increasing age (*P*-value from chi-square < 0.001). A similar but inverse relationship between age and invasive cancer is described with the rate being low in young women and increasing with increasing age (*P*-value from chi-square < 0.001). A clear relationship between HSIL and age is not described in these data.

A similar pattern of higher rates of invasive disease with increasing parity was also demonstrated (data not shown). However, age and parity are significantly correlated (Pearson's correlation coefficient = 0.51769, $P < 0.0001$) and it is not possible to separate out these effects.

Table V. Smear satisfaction rates by site and overall

Region	Satisfactory N	Satisfactory %	Satisfactory but limited N	Satisfactory but limited %	Unsatisfactory N	Unsatisfactory %	Missing (N)	Total (N)
Eastern Cape	1 590	77.9	408	20.0	25	1.2	17	2 040
Western Cape	1 221	82.8	182	12.3	64	4.3	7	2 040
Northern Cape	1 589	76.2	189	9.1	19	0.9	289	2 086
Northern Province	4 548	89.8	408	8.1	21	0.4	90	5 067
Mpumalanga	356	82.8	60	14.0	9	2.1	5	430
Gauteng	867	91.1	52	5.5	1	0.1	32	952
Free State	1 586	86.6	186	10.2	42	2.3	17	1 831
North West	2 860	90.3	127	4.0	38	1.2	142	3 167
KwaZulu-Natal	732	34.9	1 175	56.0	107	5.1	84	2 098
Hammanskraal	987	87.2	130	11.5	6	0.5	9	1 132
Total	16 336	80.6	2 917	14.4	332	1.6	692	20 277

Table VI. Distribution of cervical abnormality (number and %) by age category*

Age category	Normal (37.7 (12.2))† N	Normal %	ASCUS (37.2 (11.6)) N	ASCUS %	AGUS (43.1 (13.4)) N	AGUS %	LSIL (33.1 (9.3)) N	LSIL %	HSIL (37.9 (10.9)) N	HSIL %	Squamous invasive carcinoma (51.6 (12.8)) N	Squamous invasive carcinoma %	Columnar invasive carcinoma (46.7 (16.3)) N	Columnar invasive carcinoma %	Total for study and proportional age distribution for study and South African population N	%	(% South African population‡)
20 - 24	729	89.56	18	2.21	1	0.12	52	6.39	14	1.72	0	0	0	0	814	4.2	(17.5)
25 - 29	4 366	91.28	181	3.78	6	0.13	156	3.26	70	1.46	2	0.04	2	0.04	4 783	24.7	(15.2)
30 - 34	3 455	92.16	122	3.25	5	0.13	86	2.29	72	1.92	8	0.21	1	0.03	3 749	19.4	(13.7)
35 - 39	2 944	90.92	115	3.55	7	0.22	81	2.50	82	2.53	8	0.25	1	0.03	3 238	16.7	(11.6)
40 - 44	1 988	90.98	77	3.52	8	0.37	41	1.88	55	2.52	15	0.69	1	0.05	2 185	11.3	(9.4)
45 - 49	1 438	93.38	39	2.53	5	0.32	24	1.56	23	1.49	10	0.65	1	0.06	1 540	8.0	(7.3)
50 - 54	928	92.15	39	3.87	5	0.50	11	1.09	13	1.29	11	1.09	0	0	1 007	5.2	(5.7)
55 - 59	759	93.01	22	2.70	1	0.12	10	1.23	17	2.08	7	0.86	0	0	816	4.20	(5.0)
60+	1 130	91.20	42	3.39	6	0.48	7	0.56	20	1.61	31	2.50	3	0.24	1 239	6.4	(14.6)
Total	17 737	91.56	655	3.38	44	0.23	468	2.42	366	1.89	92	0.47	9	0.05	19 371		

* Data missing for 906 people.
†Mean age in years (SD).
‡Proportion of women in South Africa 20 years and older in each age group in the general population using 1996 census data (note denominator = all women 20 years and older).
ASCUS = atypical squamous cells of undetermined significance; AGUS = atypical glandular cells of undetermined significance; LSIL = low-grade squamous intra-epithelial lesions; HSIL = high-grade squamous intra-epithelial lesions.
Source: http://www.statssa.gov.za/census96/HTML/CIB/Population/218.htm.

Table VII presents the results from the logistical regression model. The first column indicates the variables which were found to be significant from the stepwise procedure in predicting the presence of an abnormal outcome (HSIL and cytologically diagnosed carcinoma) versus a normal outcome (normal and LSIL). Table VII shows that for every increase of 1 year in age the risk of contracting carcinoma increases 1.013 times ($P = 0.0090$), and similarly for each additional birth the risk of contracting carcinoma increases 1.076 times ($P = 0.0085$). The odds of having carcinoma are 1.309 times higher for those with clinically noticeable cervical discharge or blood present

Table VII. Summary of logistic regression model

Variable	Parameter estimate	*P*-value	Odds ratio
Intercept	–4.0570	0.0001	
Age	0.0127	0.0090	1.013
Parity	0.0732	0.0085	1.076
Cervix clinically macroscopically normal	–0.5847	0.0001	0.557
Cervical discharge or blood clinically present	0.2689	0.0150	1.309

($P = 0.0150$) than for those without. The corresponding odds are 0.557 for those whose cervix appears to be macroscopically normal on clinical examination ($P = 0.0001$), that is they are less likely to have an abnormal outcome.

In order to assess patient follow-up two sets of data were recorded. Firstly, data were recorded on the percentage of participants who received their results. These data are presented by site and overall in Table VIII. For the entire study population 92.9% of participants got their results, ranging from 99.5% in Northern Province to 51% in Hammanskraal. The method of communicating the result was similar in all sites and the composite data are presented in Table IX. Almost all the results were communicated to patients on their return visits.

Table VIII. Percentage of participants who received smear result*

Region	%
Eastern Cape	98
Western Cape	99
Northern Cape	86
Northern Province	99.5
Mpumalanga	98
Gauteng	95
Free State	79
North West	99
KwaZulu-Natal	94
Hammanskraal	51
Total	92.9

* Data missing for 1 249 individuals.

Table IX. Method of communicating results*

	N	%
Face to face	16 111	91.5
Home visit	477	2.7
Letter/message sent	389	2.2
Did not come back	323	1.8
Telephone	201	1.1
Combination of above	108	0.6

*Data missing for 2 667 women.

Appropriate recognition of patients requiring follow-up was determined by assessing if patients requiring a repeat Pap smear were recognised and asked to come back. Overall 2 094 patients (11.81%) were noted to require a repeat Pap smear. One thousand one hundred and seventy-nine women with normal results (7%) were incorrectly noted to require a repeat Pap smear; 520 women (82.3%) and 30 women (58.8%) with atypical squamous cells of undetermined significance (ASCUS) and atypical glandular cells of undetermined significance (AGUS) respectively were (correctly) noted to require a repeat Pap smear as well as 306 women with LSIL (74.6%). Forty-seven women (14.9%) with HSIL, 11 women (13.4%) with squamous invasive disease and 1 woman (10%) with columnar invasive disease were (incorrectly) identified as requiring a repeat Pap smear.

Overall the trend was to repeat Pap smears for people with ASCUS, AGUS and LSIL. However, a small proportion, but a high number, of women with normal results were noted to require a repeat Pap smear. In addition, women who had HSIL and invasive disease should have been referred for definitive treatment and not for repeat cytological examination.

Of the 423 individuals who were diagnosed as having either HSIL or invasive disease and for whom there were follow-up data recorded, 393 (92.9%) were noted as requiring referral for definitive treatment.

Discussion

This study draws its sample from a range of geographical sites and the differences between the study sites represent the diversity of conditions and services in South Africa. The age distribution of the sample, with the exception of the 20 - 24-year age groups and the over-60 age groups which are proportionally underrepresented in this sample, reflects the age structure of the South African population as indicated in Table VI. This study represents the largest community-based sample of cervical abnormality in South Africa. Both the large age-specific sample size and the similarity of the proportional representation of the age structure of the population allow for a degree of confidence in extrapolating these data to the overall South African female population.

These data indicate that 1.88% of the study population have HSIL, with an average age of just below 38 years, and therefore support the current South African cervical screening policy which is to screen women 30 years and older. These data also support the existing epidemiological data, which have established that cervical cancer is a common disease. It is clear from this study that there is a definite age relationship between LSIL and invasive disease, the former being common in younger women and decreasing with age, probably owing to regression to normal without any intervention,[19] and the latter increasing with increasing age. The absence of a clear relationship between age and HSIL may be because this entity is a combination of cervical intraepithelial neoplasia (CIN) II and CIN III where CIN II decreases with increasing age and CIN III increases with increasing age and when combined the more uniform presentation of HSIL across all age groups is described as found in this study population.

Providing a screening service

The study population, while differing between sites, nonetheless represents a cross-section of the population likely to present for cervical screening services at public sector

primary health care (PHC) clinics in South Africa. With relatively limited expenditure on advertising the service, 70% of women attended services specifically for a Pap smear. In KwaZulu-Natal and Northern Province in particular this included a significant number of older women. This indicates that there is receptiveness to, and a felt need for, cervical cancer screening among older women. Furthermore, in spite of problems in delivering services it was possible for the service to take, process and report on Pap smears. In some areas, in particular Northern Province, this worked well. With the exception of the Hammanskraal site, over 90% of patients returned for their results. This is another positive indicator for the potential of a national screening programme. Most women received their results in face-to-face consultations, which is hardly surprising given the weakness of existing infrastructure (post and telephone). This also reflects that the women made the effort to return despite the added burden this places on them. While face-to-face consultation for communicating results increases the workload of PHC staff, it is also an opportunity for health promotion with regard to women who are well, and in cases where an abnormality was noted it is an opportunity to motivate women to go for treatment and to set up appointments. So long as the communication infrastructure remains weak the need for face-to-face consultation will remain. To ensure that this is possible and that patients can return with relative ease it is essential that the decentralisation of screening services be maximised. It is also essential that a known and reliable result turnaround time be established so that women can be asked to return appropriately and that, when they do, their results will be available.

A major weakness both of this study and of the organisation of health services is the difficulty in determining whether patients with abnormalities requiring treatment do return and receive appropriate treatment. Methods to link patient data between PHC and referral sites do not exist. This aspect of PHC services, namely communication between referring and referral centres, needs to be strengthened to ensure continuity of care for patients, to provide feedback and motivation to staff and to provide data from which to assess if interventions are having the desired impact.

Appropriate follow-up

Although it is possible that the data forms were incorrectly completed it appears that guidelines for patient management and follow-up are not clearly defined. While it is justifiable to recall women requiring a repeat smear because of an unsatisfactory initial slide, the recall of women with normal results places an unnecessary burden on the health service. Failure to identify women requiring repeat smears and inappropriate repeating of Pap smears in cases requiring definitive treatment represent lost opportunities for preventing disease and possibly even death. In providing screening services patients are promised positive health benefits, so it is essential that appropriate action be taken and it is unethical for the wrong decision to be made.[20] Thus in instituting a screening programme clear guidelines must be developed and service providers and communities need to be made aware of these to ensure that responsibility for appropriate action is taken.

Variation in laboratory standards, particularly with regard to the uniform application of the Bethesda system, needs to be investigated. In this study slides were reported as being unsatisfactory but were in fact read, and are therefore likely to fit into the 'satisfactory but limited' category. The implication of this is that should results be called unsatisfactory the patient is advised to have a repeat Pap smear. In one study site this occurred in 50% of the sample. Clearly guidelines on taking Pap smears and uniformity in the interpretation of the Bethesda system are required. The cost to the health service and to the patient of unnecessary repeat smears is significant. A system that is uniform and where quality control systems are in place is essential for a national programme.

The logistical regression analysis, while of interest, should not be over-interpreted as a prevalence survey is not the most appropriate design to investigate causal relationships. This is more so in cancer research where the outcome of interest is relatively rare. Nonetheless these data are consistent with other data where cervical cancer is related to age and parity.[4,5,15,19] The finding that the clinical condition of the cervix is related to the finding of cytological abnormality (HSIL and cytologically diagnosed squamous carcinoma) is not surprising, but in this design it is hard to interpret as which condition precedes the other cannot be determined.

It should be noted that the rate of cervical abnormality differed between sites and when site was included in the regression model cervical abnormality was found to be associated with some of the sites. Possibly age differences between the sites can explain this; however, age-standardised prevalence still indicated differences between sites. The finding of no explanation of the different rates between the sites can be understood in numerous ways. Firstly, the age-specific numbers within each site are small, and care should be taken not to over-interpret these differences when such small numbers are studied. The descriptive data collected as part of this survey do not explain the differences. The differences may be a selection bias. It is possible that the location of services, e.g. in a gynaecology clinic, as was the case in the Northern Cape study compared with PHC services in most of the other studies, may explain the variation. However, no specific conclusions can be drawn from these data.

CONCLUSIONS

Overall this study described the prevalence of pre-cancerous cervical lesions and cytologically diagnosed cervical cancer in

South Africa. It is the first large multicentre study of its kind in the country. The following conclusion can be drawn from these data: (*i*) cervical cancer is a common disease and the rate of serious cytological abnormality increases with age; (*ii*) despite the limited investment in system functioning that is essential to start a programme, it was possible to take smears and report the results to patients; (*iii*) these data support the current policy to screen older women; (*iv*) health systems research should be instituted to establish the requirements for a sustainable high-quality screening programme in South Africa; (*v*) patients will attend for services and follow-up; (*vi*) methods to link primary care clinic, laboratory and treatment data are essential so that the screening programme can be monitored and the impact of the programme can be assessed; and (*vii*) laboratory standards including a uniform quality control system are required to support a cervical screening programme.

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