Low attendance by non-native women to human papillomavirus vaccination and cervical cancer screening – A Danish nationwide register-based cohort study

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A R T I C L E   I N F O

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A B S T R A C T

Background: Cervical cancer is preventable through human papillomavirus vaccination and cervical cancer screening. However, possibly due to systemic, individual (e.g. low socio-economic status) and socio-cultural barriers, it is likely that non-natives, especially non-westerners, are more prone to attend neither vaccination nor screening (combined non-attendance). This is disturbing as the non-native population in Denmark is predicted to rise to 21% by 2060. We aimed to investigate differences in combined non-attendance by nativity and region of origin, and to analyse the association between country of origin and combined non-attendance adjusted for socio-economic status.

Setting: 1.6.2007–31.12.2016 Denmark.

Methods: Logistic regression was performed to estimate crude and adjusted odds ratios with 95% confidence intervals for combined non-attendance.

Results: 170,158 women were included. Overall combined non-attendance was 11.8% [11.7–12.0]; 10.0% [9.8–10.1] for native women and 27.1% [26.4–27.7] for non-native women, with highest degrees among Middle-Eastern and North-Africans (30.1% [29.2–30.9]). Even when adjusted for socio-economics, women from Middle-East and North-Africa had substantially higher odds of combined non-attendance than natives (adj. OR = 7.5 [6.3–8.9] for Somali women).

Conclusion: Denmark has a relatively low degree of combined non-attendance. However, cervical cancer preventive programmes seem to be better tailored to the needs of native women and do not appear to cater sufficiently to the needs of the fast-growing non-native populations, particularly not to the needs of Middle-Eastern and North African women. In order to secure more just cervical cancer prevention, future studies are recommended to develop tailored intervention sensitive to the need of non-native women.

1. Introduction

Cervical cancer is the most common human papillomavirus (HPV) induced cancer (Walboomers et al., 1999; Schiffman, 2007; Ostor, 1993) and is considered preventable through pre-exposed HPV vaccination (HPVV) and routine cervical cancer screening (CCS) (Giuliano et al., 2011; Gustafsson et al., 1997; Hall et al., 2019; Vaccarella et al., 1990, 2014). In order to reach the best protection, high attendance in both programmes is required. In Denmark, the childhood HPVV programme currently has a 84% coverage among eligible girls (Girls born

2005) (Statens Serum, 2020), and the CCS programme has a 64% coverage among eligible women (Danish, 2017). However, HPVV and CCS coverages are considerably lower among non-native women, especially from non-western countries (Badre-Esfahani et al., 2019; Fernandez de Casadevante et al., 2016; Hertzum-Larsen et al., 2019; Victoria Fernández de, 2015; Harder et al., 2018).

Currently non-natives make up 14% of the Danish population, of which a approximately 60% originates from non-western countries such as Middle-East and North-Africa (MENA). It is predicted that the non-native population in Denmark will continue to rise, and will reach 21%
by 2060 (Statistics Denmark). It is possible that non-western women face distinct attendance barriers on as well as systematic, individual, and socio-cultural level. On a systemic level, these individuals may be accustomed to non-western health care systems, which differ significantly from the health care systems in western countries (e.g. little or no availability to universal and free-of-charge HPVV and CCS programmes) (Sancho-Garnier et al., 2013; Bradford and Goodman, 2013). On an individual level, they may have other preferences and expectations to the healthcare systems and healthcare professionals (Lokdam et al., 2016; Marlow et al., 2017). Non-westerns in Denmark are furthermore more often, refugees and have lower socioeconomic status (SES), than western non-natives, who most often have a work or study permit, in addition to having a higher SES (Statistics Denmark). Socio-culturally many non-westerns living in Denmark are often accustomed to diverse cultural and religious traditions (Johnson et al., 2020). All these factors could potentially prone non-western women to have high combined non-attendance (neither HPVV nor CCS). Although an increasing number of studies have investigated the HPVV and CCS attendance patterns among non-natives compared to natives, no studies have to our knowledge addressed differences in combined non-attendance patterns according to nativity and detailed region of origin, nor analysed this pattern among non-westerns compared to natives.

1.1. Aim

The aims of this study were thus to investigate differences in combined non-attendance by nativity and region of origin, and to analyse the association between country of origin and combined non-attendance adjusted for socio-economic status (SES).

2. Materials and methods

2.1. Setting

In Denmark, all citizens are registered with a personal ten-digit identification number, which is given at birth or to non-natives when they receive a residence permit. Free health care is provided to all citizens holding such personal identification number.

Denmark offers two programmes aiming to prevent cervical cancer; 1) a HPVV programme and 2) a CCS programme. The Danish Health Authority recommends that all eligible women attend both programmes (The Danish Health and Medicines, 2018). The Danish National CCS Programme invites women for their first screening when they are 23 years old. Until the age of 49 years, women are invited for screening every third year after their latest invitation or latest cervical cytology sample; women aged 50-64 years are invited every five years after the latest invitation or cervical sample. Women who do not respond to the screening invitation letter receive up to two reminders after three and six months, respectively (The Danish Health and Medicines, 2018). Since 2006, HPVV has been available through self-payment for all women regardless of their age. In 2009, HPVV was implemented in the existing childhood vaccination programme free of charge; at the time offering vaccination with the four-valent vaccine (Gardasil) to all girls aged 12–18 years (Statens Serum Institut, 2008). As a supplement to the routine childhood HPVV programme, temporary free-of-charge HPVV programmes have been launched throughout 2008–2015 for older girls born in 1985–1995 (Statens Serum, 2014). As of September 2019, the childhood HPVV programme also includes boys 12–18 years of age (Statens Serum Institut, 2019)

2.2. Study design

We conducted a nationwide register-based, closed cohort study with a study period from 1 June 2007 to 31 December 2016.

2.3. Study population

The study population encompassed women born from 1985 to 1993 who had lived permanently in Denmark during the entire study period, hence they have all been eligible for both free-of-charge HPVV and a first call for CCS.

As it was not possible to distinguish between cervical cytologies collected for screening or medical reasons, all cytologies collected before the first call for CCS were excluded to ensure that the majority of cytologies included in the study were restricted to screening cytologies. Cytologies obtained between 22.5 and 23 years of age were, however, not excluded as they were obtained close to the first screening invitation. Furthermore, to ensure that vaccination data was restricted to free-of-charge HPVV, women, who have been HPV-vaccinated outside the HPVV programme (self-paid vaccination) were excluded as they could have displayed a different health-promoting behaviour than those who were vaccinated within the programme. Lastly, women with a history of surgical removal of cervix, either due to hysterectomy or trachelectomy, and women diagnosed with cervical cancer were excluded.

2.4. Data collection and definitions

The study population was defined in the Danish Civil Registration System (Pedersen, 2011) using the 10-digit personal identification number, allowing direct and individual linkage to other national registries.

Data on self-paid HPVV were collected through the Danish National Prescription Registry (Kildemoes et al., 2011), which holds information on all redeemed prescriptions from Danish pharmacies. We extracted the prescription codes for HPV vaccines Gardasil and Cervarix (J07BM01 and J07BM02), excluding women with at least one redeemed HPV vaccine prescription. Data on surgical removal of cervix were collected from the Danish National Patient Register (Lynge et al., 2011). Data on cervical cancer were collected from the Danish Cancer Registry (Gjerstorff, 2011).

Data on free-of-charge HPVV status were collected from the Danish National Health Service Register (Andersen et al., 2011), which holds information on all tax-funded public healthcare services provided in Denmark. We extracted all codes related to HPVV services for women born in 1985–1993. For the purpose of this study, women with at least one HPVV registration during the study period were considered “vaccinated”. All other women were considered “unvaccinated”.

Data on cervical cytology were collected from the Danish Pathology Register (Bjerregaard and Larsen, 2011). This register holds pathology data from all pathology departments classified according to the Systematized Nomenclature of Medicine (SNOMED) (Roget and Stanley Robboy, 1980). Cervical cytology samples were identified by the SNOMED codes T8X3* and material type 23. Women with at least one registered cytology sample between the age of 22.5 and 24 were considered “screened”. Those with no cervical cytology within this age range were defined as “unscreened”.

Based on HPVV and CCS attendance, four attendance combinations were defined:

(1) HPV-vaccinated and cervical cancer-screened women were categorized as having “Combined attendance”; (2) HPV-vaccinated and not cervical cancer-screened women were categorised as having “Partial attendance”; (3) Not HPV-vaccinated and cervical cancer-screened women were categorized as having “Partial attendance” and lastly, (4) Neither HPV-vaccinated nor cervical cancer-screened women were categorised as having “Combined non-attendance”. We considered women in the last category to be a particularly high-risk group as they had no preventive attendance at all compared with the other three groups.
2.5. Demographic and socio-economic variables

All demographic and socio-economic variables were collected from Statistics Denmark, which allows linkage of individual data from different health registers to demographic and socio-economic data (StatisticsDenmark, 2020).

Country of origin was used to determine native background and moreover used to categorize all countries of origin into six non-Danish regions of origin. Denmark was categorized separately to allow direct comparison. This categorisation into regions of origin was based on the WHO’s regional grouping of the countries (World Health Organization. Regional offices., 2020) and empirically modified to capture not only geographical cohesion between the region’s countries but also kinds of cultural and/or religious cohesion (original WHO regional classification is available in Appendix A).

For the purpose of this study native women were defined as those having Denmark as their country of origin and non-native as those not having Denmark as their country of origin, regardless of whether they were immigrants (defined as women born outside Denmark) or descendants (defined as women born in Denmark but with two immigrant parents).

Five variables were used as proxy measures for SES and used in the adjusted statistical analyses; (1) parental civil status, (2) highest completed education level by either parent, (3) family disposable income, (4) highest level of occupation by either parent and (5) degree of urbanisation. These socio-economic data were collected in 2013 when the participants were 20–27 years old. Some of these variables (e.g. civil status, highest education, income and occupation) may not be fully established during early adulthood. In contrast, parental SES is considered both stable and influential, even into young adulthood, and was therefore used in this study (Bruna et al., 2006).

2.6. Statistical analyses

Differences in sample characteristics between the four combined attendance groups were tabulated and reported with 95% confidence intervals (CI) for comparison. In logistic regression analyses, exposure was defined as having a MENA country as country of origin compared to having Denmark as country of origin. Outcome was defined as combined HPVV and CCS non-attendance compared with partial or combined attendance. The association between exposure and outcome was analysed using logistic regression, estimating the unadjusted and adjusted odds ratio (OR) with 95% CI. Adjustments were made using all five proxy measures for SES.

In order to test the robustness of our results, two sensitivity analyses were performed. As it is likely that descendants’ health-seeking behaviour is more similar to that of native women than to immigrants’ behaviour, we excluded all descendants from the population in our first sensitivity analysis. Furthermore, to test the robustness of our modified regional categorisation of the world, we used the original WHO categorisation in our second sensitivity analysis. All statistical analyses were conducted using STATA version 15 (STATA Corp., College Station, Texas, USA).

3. Results

A total of 248,052 women were born in 1985–1993 and were resident in Denmark during the entire study period and thus eligible for inclusion. Of these, 42,290 (17%) were excluded due to self-paid HPVV. Another 35,556 (14%) were excluded due to cervical cytology obtained before the age of 22.5 years. Finally, 48 (0.02%) women were excluded due to a history of surgical removal of cervix and/or cervical cancer (Fig. 1). A total of 170,158 women remained in the study population of whom 136,264 (80% [79.8–80.2%]) were HPV-vaccinated during the study period and 83,880 (49% [49.0–49.5]) were screened (data not shown).

Table 1 shows that 151,885 (89.3% [89.1–89.4]) were natives and 18,273 (10.7% [10.6–10.9]) non-natives of whom 11,115 (60.8% [60.1–61.5]) originated from the MENA region. A total of 20,131 (11.8% [11.7–12.0]) were combined non-attenders. Degree of combined non-attendance was 10.0% [9.8–10.1] for native women and 27.1% [26.4–27.7] for non-native women. Table 1 further shows that compared with all other regions of origin, women from MENA countries had the highest level of combined non-attendance (30.1% [29.2–30.9]).

Table 2 shows the country-specific variation in the degree of combined-non-attendance in the MENA region. Degree of combined non-attendance ranged between 16.6% [13.6–20.0] among Iranian women to 52.0% [48.1–55.4] among Somali women.

Table 3 shows that compared to native women, women from all MENA countries had higher odds of being “combined non-attenders” than being either “partially or combined attenders”. This tendency decreased slightly after adjusting for demographics and SES, but remained both statistically and clinically significant for all countries. The adjusted OR of combined non-attendance ranged from 1.6 [1.3–2.1] for Iranian women to 7.5 [6.3–8.9] for Somali women.

Our first sensitivity analysis using the original WHO categorisation of world regions did not alter our conclusions regarding differences in combined non-attendance by regions of origin (Appendix B). Our second sensitivity analyses excluding descendants from the non-native population resulted in a higher combined non-attendance across all regions of origin (Appendix C), as well as higher adj. OR of combined non-attendance among women from most MENA countries compared to native (Appendix D).

4. Discussion

4.1. Main findings

This nationwide register-based cohort study showed that 10.0% of native women were combined non-attenders, while 27.1% of non-native women were combined non-attenders. Among all six regions of origin, women from the MENA region had the highest level of combined non-attendance (30.1%). Even after adjusting for SES, women from MENA countries had considerably higher odds of combined non-attendance than native women. However, large differences were observed within the MENA region. Thus, compared to native women, the odds for combined non-attendance was 7.5 times higher for Somali women and 1.5 times higher for Iranian women.

4.2. Strengths and limitations

The greatest strength of the present study is its use of individually linked nationwide register based data. This allowed us to report actual attendance in organized HPVV and CCS programmes, while limiting bias due to selection and information errors. Furthermore, we adjusted for potential confounding by adjusting for both parental and individual SES. Another embedded strength is the free-of-charge nature of the Danish HPVV and CCS programmes, which reduced any financial barrier that could have barred women with low income (such as non-natives) from attending the programmes.

A number of limitations must be acknowledged. First, due the nature of our closed cohort study, those who arrived in Denmark later than 2007 were excluded. Furthermore, women without residence permit were not eligible for preventive health care in Denmark (e.g. HPVV or CCS) and thus naturally not included in the study. Consequently, the most newly arrived immigrants were not represented in our results. As we expect that a longer residence has a positive effect on utilizing health care services such as HPVV and CCS (Kreusch et al., 2018), we believe that this limitation merely biased our result toward the null. This was also underlined in our sensitivity analyses excluding descendants. As cytology registrations in Denmark are not labelled according to uptake indication, we were unable to distinguish between
cytologies collected for screening or medical purposes. However, by excluding women with cytologies obtained prior to their first screening invitation (< 22.5 yrs.), we believed to have excluded most samples collected for other reason beside screening (e.g. for medical purposes) and thereby minimising the risk of information bias in our outcome. Furthermore, we had no data on whether non-native women had attended HPVV or CCS in their country of origin. Many western countries currently provide HPVV and CCS programmes. These women’s combined non-attendance could therefore actually be lower than reported in our study. In contrast, it is hardly likely that non-western women attend vaccination or and screening in their home countries, as organized screenings programmes are insufficiently introduced in the MENA region (Sancho-Garnier et al., 2013). Thus, the results regarding these women would therefore be accurate despite the lack of this information. The absence of a valid and culturally sensitive categorisation of regions of the world required us to modify existing categorisations. We analysed our descriptive results using the original WHO grouping to test the robustness of this modification and to challenge our findings regarding MENA countries having the highest combined non-attendance. This sensitivity analysis did not alter our conclusions. It is likely that descendants have a health behaviour more adapted to the Danish ways compared to immigrants. However, due to lack of power, we were unable to stratify non-native women according to birth country. This would have been favourable, suggested by our sensitivity analyses. However, due to the relatively few birth cohorts offered HPV vaccination has reached screenings age, it was not possible for us to increase our dataset and achieve power to do so. Finally, due to the relatively short follow-up period (18 months), some participants may have attended CCS at a later time and may therefore have been misclassified as “un-screened”. CCS participation is generally lowest among the youngest (< 30 yrs.) group of women and more pronounced among non-native women than native women (Hertzum-Larsen et al., 2019). Therefore, it might be possible that more women, particularly non-natives, would have attended if we had included a second screening round. Besides, data on CCS participation were collected between 22.5 and 23 years of age, and some women could have postponed their screening participation due to pregnancy, as screening during pregnancy is not recommended in Denmark. Thus, some women would falsely be defined as unscreened when in fact they did participate in CCS at a later time. However, relatively few women become pregnant at 23 years (Statistics, 2017) in Denmark where the mean age at first pregnancy is 29.2 years (Statistics, 2017). Nonetheless, young non-native women from non-western countries have a slightly higher fertility rate (1958, 1854 pr. 1000 immigrant and descendant women) than native women (1762 pr. 1000 women) (Statistics, 2017). This could potentially have slightly affected our results, as more non-native than native women could have postponed CCS. In future studies, it is therefore recommended to include information of pregnancy in the interpretation of CCS attendance.

4.3. Findings in relation to other studies

Our main findings were in line with other national and international studies showing generally lower HPVV and CCS attendance among non-native women, especially among women from MENA region (Hertzum-Larsen et al., 2019; Fernandez de Casadevante et al., 2016; Moller et al., 2016,2018; Fernandez de Casadevante and Gil Cuesta, 2015; Widgren et al., 2011; Slatteld Schreiber et al., 2015; Hertzum-Larsen et al., 2019; Aminisani et al., 2012; Lofters et al., 2010,2017), compared to native women. Our results add to this existing literature by illustrating that across non-native populations, combined attendance patterns are diverse and particularly non-favourable for women from the MENA region. This overrepresentation of combined non-attendance among women from MENA countries was present even when adjusting for parental and individual SES.

Even though sharing many similar cultural and religious beliefs, the MENA region covers several countries with diverse language, history, traditions and healthcare systems, potentially giving rise to the observed differences in attendance within the MENA region. One possible explanation for the excessive CCS non-attendance rates observed among Somali women compared to women from other MENA countries, is the traditional female circumcision which have been practiced intensely previously in Somali (Abdullahi et al., 2009). However, it is not likely that female circumcision explains Somali women’s excessive HPVV non-attendance. Contrary, we observed that Iranian women had a level of combined non-attendance closer to that of native women. It is likely that Iranian women differ from women from other MENA countries in reasons of emigration. As Iranians dominantly emigrate from Iran due to political persecution and resistance to the religious regime, and not due to war, natural catastrophes or hunger as is the main reason for most other refugees in the world. Hence, Iranian women may be less inhibited by religious and traditional barriers than women from other Middle Eastern countries. Common for non-western immigrants whether they flee due to war, poverty, religious or political persecution is a more traumatising migration process than experienced by western immigrants which may have affected negatively on the women’s health preventive behaviour due to mental issues (Mangrio et al., 2018; Hudson et al., 2016). Our study design did, however not allow investigation of such subjective underlying barriers.

Previous qualitative studies of either HPVV or CCS have identified the following barriers for HPVV and CCS for women from MENA countries; language barriers, lack of knowledge and awareness regarding cervical cancer and its prevention, low perceived risk as well as fear and embarrassment regarding screening uptake, stigmatization of cancer especially in female genitals, fatalistic beliefs, fear of promiscuous behaviour after HPVV, and lack of trust in the health care
Table 1
Distribution of combined attendance in cervical cancer prevention of the total population, by nativity and Region of origin.

| (n, %col)                      | Vaccinated Screened | Vaccinated un-screened | Un-vaccinated Screened | Un-vaccinated Un-screened |
|-------------------------------|---------------------|------------------------|------------------------|---------------------------|
|                               | n                   | % row (95% CI)         | n                      | % row (95% CI)            | n                       | % row (95% CI) |
| Total study population        | 38.6% – 39.1%       | 13,763                 | 20,131                 | 66,354                    | 15,184                  | 11.8% – 12.0% |
| Native population (151,805, 89%) | 43.7% – 43.9%      | 66,147                 | 12,549                 | 66,354                    | 15,184                  | 10.0% – 10.1% |
| Non-native population (18,273, 11%) | 20.6% – 21.2%    | 8,349                  | 1,041                  | 66,354                    | 15,184                  | 9.8% – 10.1%  |
| Non-Europe (89,885, 51%)      | 57.9% – 58.2%       | 57,798                 | 7,033                  | 66,354                    | 15,184                  | 5.9% – 6.0%   |
| MENA countries*               | 45.7% – 46.4%       | 8,349                  | 1,041                  | 66,354                    | 15,184                  | 4.8% – 7.1%   |
| Middle-East North Africa (11,115, 61%) | 14.2% – 14.9%  | 5,558                  | 633                    | 66,354                    | 15,184                  | 3.8% – 5.5%   |
| Eastern Europe, Central Asia (3,283, 18%) | 29.5% – 31.1% | 1,289                  | 301                    | 66,354                    | 15,184                  | 2.0% – 2.0%   |
| South East Asia (1,923, 11%)  | 30.9% – 33.0%       | 849                    | 102                    | 66,354                    | 15,184                  | 1.3% – 2.1%   |
| Western countries (1,028, 6%) | 34.7% – 37.6%       | 335                    | 114                    | 66,354                    | 15,184                  | 1.0% – 1.1%   |
| Sub-Sahara (605, 3%)          | 32.9% – 36.8%       | 233                    | 49                     | 66,354                    | 15,184                  | 0.6% – 1.1%   |
| Latin America (151, 1%)       | 37.1% – 45.3%       | 61                     | 10                     | 66,354                    | 15,184                  | 0.6% – 1.1%   |
| Missing (168, 0.1%)           | 4.2% – 8.4%         | 24                     | 5                      | 66,354                    | 15,184                  | 0.3% – 0.6%   |

Time and place of the study: 1.6.2007 – 31.12.2016 in Denmark

Table 2
Distribution of combined attendance in cervical cancer prevention according to country of origin.

| (n, %col)                      | Vaccinated Screened | Vaccinated un-screened | Un-vaccinated Screened | Un-vaccinated Un-screened |
|-------------------------------|---------------------|------------------------|------------------------|---------------------------|
|                               | n                   | % row (95% CI)         | n                      | % row (95% CI)            | n                       | % row (95% CI) |
| Denmark (151,885)             | 66,354              | 43.7% (43.4% – 43.9%)  | 57,798                 | 38.1% (37.8% – 38.3%)     | 12,549                  | 8.3% (8.1% – 8.4%) |
| MENA countries* (11,115)      | 151,805             | 557                    | 2,067                  | 53.7% (52.1% – 55.3%)     | 184                     | 4.8% (4.1% – 5.5%) |
| Turkey (3,849, 35%)           | 14.5% (13.4% – 15.6%) | 2,067                  | 53.7% (52.1% – 55.3%)  | 184                       | 4.8% (4.1% – 5.5%)     | 1,041         | 27.0% (25.6% – 28.5%) |
| Lebanon (1,312, 12%)          | 15.3% (13.6% – 17.2%) | 709                    | 45.8% (42.8% – 47.8%)  | 115                       | 7.3% (6.1% – 8.7%)     | 502          | 32.1% (29.7% – 34.4%) |
| Pakistan (1,086, 10%)         | 16.4% (14.8% – 18.5%) | 670                    | 51.1% (48.3% – 53.8%)  | 91                        | 6.9% (5.6% – 8.4%)     | 336          | 25.6% (23.3% – 28.1%) |
| Afghanistan (956, 9%)         | 11.9% (9.9% – 14.1%) | 559                    | 51.5% (48.5% – 54.5%)  | 38                        | 3.5% (2.5% – 4.8%)     | 388          | 35.7% (32.9% – 38.7%) |
| Somalia (734, 7%)             | 7.1% (5.3% – 9.2%)   | 250                    | 34.1% (30.6% – 37.6%)  | 52                        | 7.1% (5.4% – 9.2%)     | 380          | 52.0% (48.1% – 55.4%) |
| Iran (560, 9%)                | 28.9% (25.2% – 32.9%) | 265                    | 47.3% (43.1% – 51.6%)  | 40                        | 7.1% (5.2% – 9.6%)     | 93           | 16.6% (13.6% – 20.0%) |
| Other MENA countries (574, 5%) | 13.8% (11.1% – 16.9%) | 276                    | 48.1% (43.9% – 52.3%)  | 47                        | 8.2% (6.1% – 10.7%)    | 172          | 30.0% (26.2% – 33.9%) |
| Morocco (478, 4%)             | 13.0% (10.1% – 16.3%) | 205                    | 42.9% (38.4% – 47.5%)  | 27                        | 5.6% (3.8% – 8.1%)     | 184          | 38.5% (34.1% – 43.0%) |

*MENA countries with more than 450 observations are reported individually, while the remaining countries reported as "other MENA"

Time and place of the study: 1.6.2007 – 31.12.2016 in Denmark
Table 3
Odds Ratios (OR) for combined non-attendance among women from MENA countries compared to women from Denmark.

|                | Unadjusted OR (95% CI) | Adjusted OR* (95% CI) |
|----------------|------------------------|-----------------------|
|                | Ref.                   | 1 Ref.                |
| Denmark        | 1                      | 1                     |
| Turkey         | 3.3 (3.1 – 3.6)        | 3.0 (2.8 – 3.3)       |
| Iraq           | 4.2 (3.8 – 4.7)        | 3.3 (2.9 – 3.7)       |
| Lebanon        | 3.1 (2.7 – 3.5)        | 2.7 (2.3 – 3.1)       |
| Pakistan       | 5.0 (4.4 – 5.7)        | 4.5 (3.9 – 5.1)       |
| Afghanistan    | 3.1 (2.7 – 3.6)        | 2.6 (2.2 – 3.1)       |
| Somalia        | 9.7 (8.4 – 11.2)       | 7.5 (6.3 – 8.9)       |
| Iran           | 1.8 (1.4 – 2.3)        | 1.6 (1.3 – 2.1)       |
| Other MENA     | 3.9 (3.2 – 4.6)        | 3.5 (2.8 – 4.2)       |
| Morocco        | 5.6 (4.7 – 6.8)        | 4.6 (3.7 – 5.7)       |

* Adj. for highest achieved parental education, parental civil status, highest parental occupation disposable household income and individual degree of urbanization.

Time and place of the study: 1.6.2007 – 31.12.2016 in Denmark.

system (Chan and So, 2017; Ferdous et al., 2018; Ferrer et al., 2014; Gele et al., 2017; Johnson et al., 2008; Marlow et al., 2015; Wilson et al., 2018; Zeraiq et al., 2015; Islam, 2017; Salad et al., 2015).

Qualitative studies exploring common barriers towards HPVV and CCS attendance are, however, very few. Allen et al. interviewed 31 health care-insured Somali women living in the USA about barriers and facilitators for combined attendance, reporting a generally high level of knowledge of cervical cancer and CCS, but relatively low levels of knowledge of HPV and HPVV. In an attempt to improve combined attendance, they suggested that direct and community-based educational interventions be implemented (Allen et al., 2019). Grandahl et al. investigated combined non-attendance among 50 newly arrived non-native women living in Sweden. Although the interviewees were positive towards cervical cancer prevention, they disclosed several barriers, mainly low language skills and limited knowledge regarding HPV and cervical cancer. Grandahl et al. recommended that health information be given in native language, and that health care providers be more aware of non-native women’s culturally distinct barriers (Grandahl et al., 2015). Based on the above studies, it seems that tailored interventions targeting both HPVV and CCS are needed in order to increase combined attendance among non-native women, particularly from MENA countries. However, no such studies have to our knowledge yet been conducted.

5. Conclusion

In general, Denmark has a relatively low degree of combined non-attendance. However, cervical cancer preventive programmes seem to be better tailored to the needs of native women and do not appear to cater sufficiently to the needs of the fast-growing non-native populations, particularly not to the needs of Middle-Eastern and North African women. In order to secure more just cervical cancer prevention, future studies are recommended to develop tailored intervention sensitive to the need of non-native women.

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Ethical approval

According to Danish legislation and the Central Denmark Region Committees on Biomedical Research Ethics, the study did not require ethical approval because it was based on register data. The same institutions waived patient consent for use of register data. In accordance with Danish law and the EU’s General Data Protection Regulation, the project was listed at the Central Denmark Region internal list of research projects (J. No.: 1-16-02-400-16).

Disclosure

Andersen B has received HPV test kits and HPV self-sampling devices from Roche and Axlab for other studies. Pedersen LK has received speaker’s fee from Merck and Sanofi Pasteur in relation to lectures on HPV vaccines. The authors report no conflicts of interest in this work.

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Author contributions

All authors made substantial contributions to both design, achievement of data, analysis, and interpretation of data.

The first author drafted the manuscript as well as conducted the initial analysis. The other authors took part in revising the manuscript, figure and tables critically, gave final approval of the version to be published and agree to be accountable for all aspects of the work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2020.101106.

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