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Cancer incidence among 1st generation migrants compared to native Danes – A retrospective cohort study

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ABSTRACT

Study aims: To investigate the incidence of cancer among 1st generation migrants compared to native Danes, including time trends in the risk of cancer among migrants.

Methods: A retrospective cohort study design. Migrants were matched 1:4 on age and sex with a Danish born reference population. The cohort was linked to the Danish Cancer Register and cancer cases among migrants ($n = 537$) and native Danes ($n = 2829$) were identified.

Results: The overall cancer incidence did not differ significantly between migrants from East Europe and native Danes; whereas migrants from the Middle East and North Africa had a significantly lower incidence. All migrants had a significantly lower incidence of breast and colorectal cancer but male migrants from East Europe had a significantly higher incidence of lung cancer.

Conclusions: The overall cancer incidence among migrants was lower compared to native Danes. The time trends of the study are interesting and a relevant topic for further research.

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1. Introduction

Since the 1960s, immigration has changed the demographics of Denmark. Today, 353,567 persons are 1st generation migrants corresponding to 6.5% of the population; and this number is likely to increase over time.¹ The largest non-Western groups originate from: Turkey, Iraq, Lebanon, Bosnia, Pakistan, ex-Yugoslavia and Somalia. Most Turks, Pakistanis and some ex-Yugoslavs are labour migrants followed by their immediate family, whereas Bosnians, Iraqis, Lebanese and Somalians are mainly refugees. Migrants represent a challenge to policy makers and clinicians in the existing healthcare system because of differences in disease patterns and healthcare utilisation compared to the host population. However, epidemiological studies on migrant populations – both refugees and family reunited immigrants – in Europe are scarce, not least concerning chronic diseases including cancer.

The worldwide incidence patterns of cancer show large geographical variations.^{2–4} Overall, they are high in most Western countries and low in Africa as well as South Asia. Accordingly, Western studies of cancer incidence show that migrants from developing countries tend to have lower overall cancer incidence compared to natives.^{5–9} However, most of these studies originate from ex-colonial countries with a long history of immigration and not from new immigration countries such as the Scandinavians. Accordingly, they concern somewhat different migrant groups compared to those of the new European immigration countries. Moreover, few European studies investigate the impact of duration of residence in the host country on recent migrants' cancer incidence. However, to be able to efficiently prevent, diagnose and treat cancer among migrants, knowledge is needed about cancer incidence and the developments over time. Consequently, our objective was to investigate the overall incidence

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of cancer and selected specific cancer types among 1st generation migrants compared to native Danes. Moreover, we studied temporal trends in the incidence of cancer among 1st generation migrants.

2. Patients and methods

2.1. Study cohort

The study cohort was obtained through the Statistical Department at The Danish Immigration Service (TDIS). Migrants who obtained residence permits as refugees or through family reunification in Denmark from 1.1.1993–31.12.1999 were included. In total 84,379 individuals were identified in this period. Individuals who were <18 years ($n = 18,861$) when they obtained residence permits, were excluded. Another 3042 individuals were excluded due to missing civil registration numbers or because their personal security numbers appeared more than once in the sample. The study population then amounted to 62,476 individuals. A Danish born reference population was identified through Statistics Denmark (SD). SD formed a 6:1 matching at population level on sex and age upon arrival in Denmark. Moreover, all controls were Danish born residents with Danish born parents to avoid including 2nd generation migrants. Controls were only used once. Data from SD included: socioeconomic information, date of death and dates of emigrations. We then matched 4:1 on an individual level on age and sex through a random sampling procedure. This was done so as to be able to identify to which case every single control belonged to. In total we were able to make a 4:1 matching except for four cases, where a total of five controls were missing. The reason why we were not able to identify all controls for these cases was that possible controls had died within the year, before the case obtained a residence permit. This was especially true for elderly controls, and for controls whose cases got resident permits at the end of the year. In total 249,899 controls were identified. During our subsequent analyses of the cohort, we found that 14 cases had unclear or missing data on nationality. All these cases and their corresponding controls were excluded. Additionally, one case and its corresponding four controls were excluded because the date of death was 1 year before the date that the residence permit was given.

The final study cohort comprised of 123,670 women of whom 24,734 were 1st generation migrants, and 111,528 men of whom 22,306 were 1st generation migrants. The civil registration numbers of the study cohort were linked to The Danish Cancer Register, which rendered data on: diagnosis and time of diagnosis. Subsequently, all individuals in the cohort diagnosed with cancer from 01.01.1993–31.12.2003 were identified. Only the first diagnosis of cancer in the Danish Cancer Register was included. Additionally, non-melanoma skin cancers were excluded. Only migrants from East Europe including the Balkans and from the Middle East and North Africa were included in the final cohort as they formed the two largest migrant groups. Only persons between 30 and 80 years of age were included. In total 3366 cancer cases were identified of whom 537 were migrants and 2829 were native Danes. Characteristics of migrant cancer cases are shown in Table 1.

Table 1 – Characteristics of the migrant cancer cases of the study

Migrant cancer cases	Women	Men
Country of origin^a	% (n)	% (n)
East Europe incl. Balkans	80 (207)	73 (201)
Middle East and North Africa	20 (53)	27 (76)
Total	100 (260)	100 (277)
Migrant type	% (n)	% (n)
Refugees	76 (199)	87 (240)
Family reunited	24 (61)	13 (37)
Total	100 (260)	100 (277)
Duration of residence		
0 years	39 cases	29 cases
1 year	34 cases	30 cases
2 years	39 cases	40 cases
3 years	33 cases	38 cases
4 years	29 cases	42 cases
5 years	27 cases	29 cases
6 years	30 cases	32 cases
≥7 years	29 cases	37 cases
Total	260 cases	277 cases

a The Danish control group included 1651 female cancer cases and 1178 male cancer cases.

2.2. Statistical analyses

Statistical analyses were formed separately for men and women. Incidence of first cancer event was estimated as cases per 10,000 person years at risk. Person years at risk were calculated for migrants and their respective control from date of residence permit of migrant to date of diagnosis, death, migration or December 31, 2003. We analysed overall cancer incidence as well as the specific incidence for breast cancer, colorectal cancer and lung cancer. In the analysis we adjusted for the following variables: age; migrant type (refugee versus family reunited), region of origin (East Europe; Middle East and North Africa; and Denmark) and duration of residence in one year intervals. However, in the analyses of specific cancers we were not able to adjust for all these variables due to low cell counts. Our models were reduced successively using LR tests, each time removing the risk factor with the highest p -value above the level of 0.05. Adjusted rate ratios and 95% confidence intervals were evaluated by Poisson regression with log person years as off set and with a log link. This was done by using PROC GENMOD in SAS version 8.

3. Results

Table 2 shows rate ratios (RR) of overall cancer incidence for women and men adjusted for age, region of origin, migrant type and duration of residence. Native Danes formed the reference group ($RR = 1.0$). In the analysis of women we adjusted for all the above mentioned variables in the initial model. Next, we reduced the model by testing the variables one by one and excluding variables with a p -value above 0.05. There was no significant effect of migrant type ($p = 0.81$). Thus, the final model presented in Table 2 is adjusted for age, region of origin and duration of residence. This analysis showed that women from the Middle East and North Africa had a signifi-

Table 2 – Rate ratios of overall cancer incidences at entry to Denmark for migrant women and men compared to native Danes adjusted for age, region of origin, migrant type and duration of residence

Region of origin	Overall cancer women		Overall cancer men	
	Rate ratio (95% CI)	n	Rate ratio (95% CI)	n
Denmark	1.00 (–)	1651	1.00 (–)	1178
Middle East + Northern Africa	0.48 (0.35–0.67)	53	0.74 (0.59–0.94)	76
East Europe (incl. Balkans)	0.97 (0.78–1.21)	207	1.15 (0.99–1.34)	201

cantly lower overall cancer incidence (RR = 0.48; CI = 0.35–0.67) compared to native Danish women. However, the overall cancer incidence (RR = 0.97; 95%CI = 0.78–1.21) of women from East Europe did not differ significantly from that of native Danish women. In the initial model for men we likewise adjusted for age, region of origin, migrant type and duration of residence. Again, we reduced the model by testing the variables one by one as described above. There was no significant effect of migrant type ($p = 0.91$) or duration of residence ($p = 0.71$). Thus, the final model presented in Table 2 is adjusted for age and region of origin. This analysis showed that men from the Middle East and North Africa had a significantly lower overall cancer incidence (RR = 0.74; 95%CI = 0.59–0.94) compared to native Danish men. In contrast, the overall cancer incidence (RR = 1.15; 95%CI = 0.99–1.34) of men from East Europe was higher than that of native Danish men, albeit only borderline significant.

The analyses of impact of duration of residence were performed only among migrants. Figure 1 shows the trend and rate ratios (95% CI) of duration of stay on cancer incidence among female migrants over a 10 year period adjusted for age, migrant type and region of origin. Figure 1 shows that there is an annual rate reduction in cancer incidences of 5% (CI = 0%;10%) among migrant women. This trend was signifi-

cant ($p = 0.035$). Figure 2 similarly shows the effect of duration of stay among migrant men over a 10 year period adjusted for age, migrant type and region of origin; however, this analysis did not show any significant change over time.

To better understand the results of the overall cancer incidence analyses we subsequently calculated rate ratios for migrants compared to native Danes within the most prevalent specific cancer types in Denmark: breast cancer, colorectal cancer and lung cancer. Again, native Danes formed the reference group. Like the analyses of overall cancer we adjusted for age, migrant type, region of origin and duration of residence; this was done stepwise excluding non-significant variables from the models. Due to low cell counts we were, however, not able to adjust for all the mentioned variables in every analysis. In the analyses of breast cancer and colorectal cancer there were no differences among migrants and therefore all migrants were compared to native Danes.

The results showed that migrant women ($n = 70$) had a significantly lower incidence (RR = 0.51; 95% CI = 0.40–0.66) of breast cancer compared to native Danish women ($n = 575$). Migrant men ($n = 19$) had a significantly lower incidence (RR = 0.53; 95%CI = 0.33–0.85) of colorectal cancer compared to native Danish men ($n = 153$). Also, migrant women ($n = 18$)

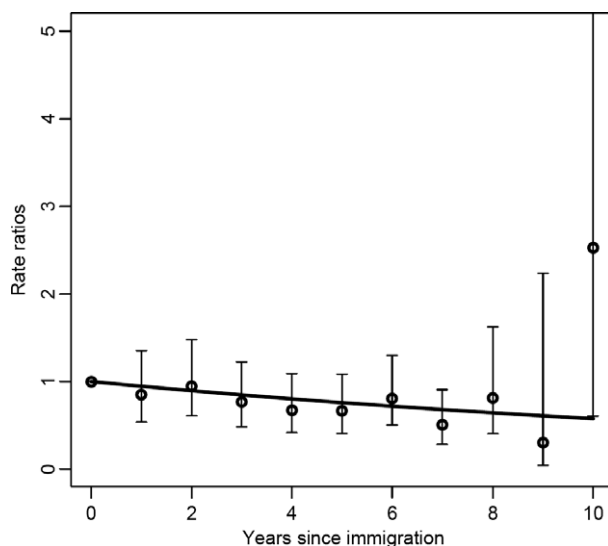


Fig. 1 – Trend and rate ratios (95% CI) of duration of stay on cancer incidence among migrant women over a 10 year period adjusted for age, migrant type and region of origin.

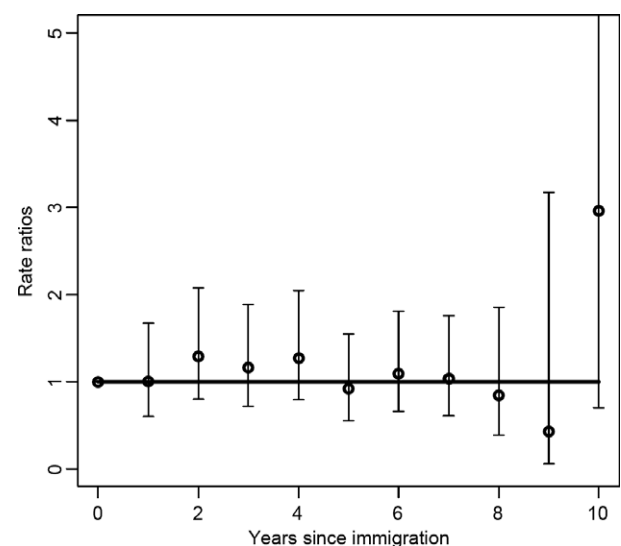


Fig. 2 – Trend and rate ratios (95% CI) of duration of stay on cancer incidence among migrant men over a 10 year period adjusted for age, migrant type and region of origin.

had a significantly lower incidence (RR = 0.48; CI = 0.29–0.77) of colorectal cancer compared to native Danish women ($n = 162$). In our analysis of lung cancer only migrants from East Europe were included as our initial analysis showed a markedly high rate of lung cancer within this group. Men from East Europe ($n = 75$) had a significantly higher incidence (RR = 2.29; CI = 1.69–3.10) of lung cancer compared to native Danish men ($n = 185$). In contrast, women from East Europe ($n = 24$) had a lower incidence (RR = 0.88; CI = 0.56–1.39) of lung cancer compared to native Danish women ($n = 174$), although the result was not significant.

4. Discussion

The study highlights some of the advantages and limitations of making register-based cohort studies on migrants. On the positive side, the design enabled us to identify accurately all refugees and family reunited individuals who entered Denmark over a 7-year period and to follow them prospectively for a total of 10-years using register data of high quality. As such the study is the only cohort based study of European migrant cancer cases that we are aware of. But, because the overall incidence of cancer is likely to be lower among migrants and Denmark is a small country, we identified relatively few migrants with cancer. Secondly, we did not control for socioeconomic status although it is well known that lifestyle related cancer incidence such as breast cancer and lung cancer differs with socioeconomic status^{10,11} and migrants tend to have lower socioeconomic status than the majority of the population. We did not control for socioeconomic status because the available register data on this are considered inconsistent and of low validity for 1st generation migrants. Thirdly, due to the relatively low number of cases we were unfortunately not able to adjust for all the desired variables in the analyses of specific cancers.

Our findings showed that the overall cancer incidence did not differ significantly between migrants from East Europe and native Danes; whereas migrants from the Middle East and North Africa had a significantly lower incidence compared to native Danes. For breast cancer and colorectal cancer all migrants had significantly lower incidences compared to native Danes. However, male migrants from East Europe had remarkably higher incidences of lung cancer compared to native Danes, whereas female migrants from East Europe did not differ. Our results are supported by other European studies,^{5–9} which have generally documented that 1st generation migrants have lower overall cancer incidence and lower incidence of lifestyle related cancers compared to native populations. Estimations from the International Agency for Research on Cancer (IARC) are available for many cancers in all major countries.^{2,3} These data show that the Middle East and North Africa have lower incidences of lifestyle related cancers but higher incidences of cancers related to infectious diseases, which is also supported by a recent Dutch study.⁸ Unfortunately, we were not able to analyse the latter group of cancer because of too small numbers. For East Europe, IARC data shows incidences that are more consistent with that of the Danish population. Consequently, our findings among recently arrived migrants likely reflect the incidences of these

migrants' countries of origin. The lower cancer incidences for overall cancer, breast cancer and colorectal cancer among migrants are encouraging. Apart from genetic factors, lifestyle patterns may play a protective role. Unfortunately, studies^{12,13} have shown that incidences of lifestyle cancers among migrants converge over time to that of host populations. Therefore, preventive information should target 1st and 2nd generation migrants as early as possible. An exception to the above pattern of lifestyle cancer is that of lung cancer among males from East Europe. Other studies^{14,15} describe certain groups of migrant men as more exposed to smoking and having higher incidences of lung cancer. The result is discouraging and calls for preventive interventions from health authorities targeted at migrant men. However, men are often forgotten when targeting preventive interventions at migrants.

Secondly, in our analysis of temporal trends, we compared newly arrived migrants to those who had been residents for up to 10 years. For males we found no differences in cancer incidence; however, for females the incidence declined over time. In light of the above discussion of lifestyle, we had assumed that the inverse process would be the outcome of the analysis. This could possibly have been the case if we had followed the group for a longer period of time. The finding may be associated with migrants' access to healthcare services before and during migration. Migrants – especially refugees – are likely to have had impaired access for longer periods of time or at least access to substandard healthcare services including lack of cancer screening services in the countries of origin or transition countries. Consequently, the decline in overall cancer among migrant women could be interpreted as the result of increased cancer diagnostic activities including screening within the first years of arrival as a result of better access to relevant services and higher quality of health care. If so, the result emphasises the importance of screening programmes for migrants upon arrival in host countries.

In conclusion, the study highlights that migrants differ in incidence patterns depending on their region of origin. The overall incidence is lower, which is encouraging but also necessitates preventive responses to avoid migrants' cancer incidence converging towards that of the host population. The remarkably high incidence of lung cancer among men from East Europe should prompt public health authorities to target this group with preventive initiatives. The temporal trends of the study are interesting and a relevant topic for further research.

Conflict of interest statement

None declared.

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