

Introduction

Pregnancies complicated by cancer are rare but incidence has been increasing in recent decades, particularly in countries where women have a tendency to postpone childbirth for socioeconomic reasons ¹.

The occurrence of cancer during pregnancy is uncommon with an incidence of ~1 in 1000 pregnancies ². Identification of cancer during pregnancy can be difficult. The symptoms of cancer can easily be attributed to and be masked by physiological changes of pregnancy. This can lead to a delay in investigations being performed and a delay in the diagnosis ³.

The most common malignancies associated with pregnancy are, in order of decreasing frequency, melanoma, breast cancer, cervical cancer, lymphomas and leukaemia's ⁴. These malignancies are typically the most frequent cancers found in nonpregnant women of childbearing ages ⁵.

Oncologic management during pregnancy should be carried out by the MDT. It poses a challenge weighing the balance of maternal and fetal wellbeing with optimal oncologic treatment. It should not significantly endangering fetal and maternal safety ¹.

Where possible standard treatments should be used, surgical and systemic treatment where compatible with pregnancy both play an important part of treatments. However, if aggressive or advanced cancer is diagnosed in early pregnancy, termination is an option. Preterm delivery in order to commence commencement oncologic treatment should be avoided due to concerns of long-term morbidity of preterm childrens.

Babies born to mothers with cancer have a higher risk of being born prematurely, with a low birth weight and by caesarean sections ⁶.

Study design

Data was obtained from the US National Infant Sample (NIS) database. We included women in the NIS with a pregnancy between January 2015 and December 2017.

The design of the NIS database offers only hospitalisation specific episodes, not a patient specific analysis. The small study period means it is unlikely that a patient will have more than a single pregnancy episode during the study period. The NIS includes sampling weights in order to calculate a national estimate. The NIS was created with a sample of discharges from hospitals participating in the Healthcare Cost and Utilization Project, which is approximately 20% of all discharges from US hospitals. Therefore, we applied the trend weight in all our analyses.

We considered the most common types of cancer in our study cohort being the area of study. Using International Statistical Classification of Diseases and Related Health Problems 10th Revision diagnosis codes we identified the five most common malignancies within the study population. Using the five most common malignancies: Breast, thyroid, cervical, skin and haematological malignancies to use within this analysis.

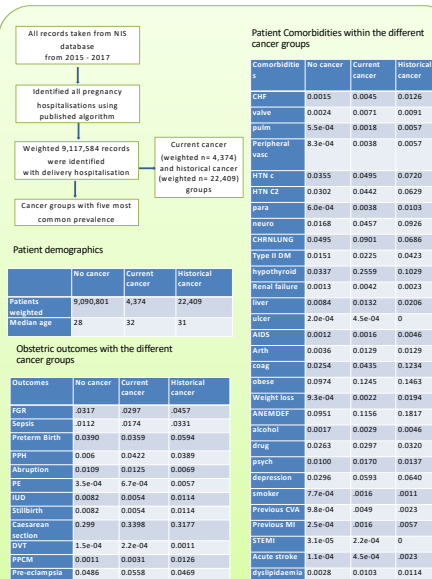
We then looked at historical and current diagnoses of these cancer types. We extracted covariate information on demographic characteristics, obstetric factors, and comorbidities. All analyses were conducted using Stata/MP version 14.0 statistical package (StataCorp LP).

Continuous variables are presented as median and interquartile range (IQR); categorical data are presented as numbers and percentages. We used sampling weights per discharge provided by the AHRQ to calculate national estimates and to correct variations.

The c2 test and t-test were used to determine statistical difference between the groups for categorical and continuous variables, respectively. Binary logistic regression analyses were conducted to examine the impact of cancer diagnosis pregnancy complications and outcomes.

We adjusted for the following potential confounders: year of admission, age, ethnicity, median ZIP code income quartile and the comorbidities

Results



References

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Patient demographics					
	Cervix cancer	Haem cancers	Thyroid cancer	Skin cancer	Breast cancer
Patients weighted	300	2,034	960	67	61
Median age	31.4	29.5	30.9	32.3	33.6

Obstetric outcomes with the different cancer groups					
Outcomes	Cervix	Haem	Thyroid	All skin	Breast
FGA	0.0333	0.1130	0.0625	0.0896	0.1148
Preterm birth	0.1333	0.0541	0.0268	0.0448	0.0984
PPH	0.0833	0.0369	0.0357	0.1045	0
Abruption	0.0167	0.0025	0.0089	0	0.0164
PI	0	0.0025	0	0.0149	0
UID	0.0333	0.0098	0	0.0149	0
Stillbirth	0.0333	0.0098	0	0.0149	0
Caesarean section	0.6000	0.3071	0.2946	0.2687	0.3115
PPCM	0	0.0172	0	0.0149	0
PET	0	0.0565	0.0446	0.0746	0.0328
Sepsis	0.0667	0.0319	0.0268	0	0.0164

Patient Comorbidities within the different cancer groups					
Comorbidities	cx	Haem	Thyroid	All skin	Breast
CHF	0	0.014	0	0.0149	0
Valve	0	0.0147	0	0	0
Pulmonary	0	0.0094	0	0.0149	0
Periph. Vasc.	0	0.0049	0	0	0
HTN C	0.0500	.000835	.0446	0.0597	0.0328
HTN C2	0.0500	0.0661	0.0446	0.0597	0.0328
para	0.0167	.0074	0	0	0
Neuro	0.0833	0.0442	0.0446	0.0448	0
CHRNILUNG	0.0467	.0541	0.0268	0.2090	0.0328
Type II DM	0	0.0541	0.0536	0	0.0328
Hypothyroid	0.0500	0.0909	0.2946	0.0896	0.0984
Renal Failure	0	0	0.0089	0	0
liver	0.0333	0.0221	0.0379	0	0
AIDS	0.0333	0.0025	0	0.0149	0
Arthropathy	0	0.0172	0	0	0
Coagulation	0.0667	0.1892	0.0446	0.0597	0.0656
Obesity	0.1167	0.1548	0.2054	0.0896	0.0656
Weight loss	0	0.0074	0	0	0
ANEMDEF	0.1667	0.1966	0.1161	0.1194	0.1303
Alcohol	0	0.0049	0	0	0
Drug use	0.0667	0.0344	0.0089	0.0149	0.0492
Psych	0	0.0123	0	0.0149	.0164
Depression	0.0333	0.0639	0.0446	0.0746	0.0492
Previous CVA	0	0.0025	0	0.0149	0
Previous MI	0	0.0025	0.0089	0	0
Acute stroke	0	0.0025	0	0.0149	0
Lymph	0	0.0123	0	0.0446	0

Discussion

Our cohort with the five most common malignancies in pregnancy compared well with previously published cohorts which identified similar types.

Women with current and historical diagnoses of cancer were older compared to those with no diagnosis of cancer (median ages of 32 years and 31 years vs 28 years). Similarly patients with haematological cancers were younger than other groups. Women with a current diagnosis of cancer had a higher proportion of White ethnicity compared to those with a historical or without a diagnosis. Patients with current cancer had lower income levels compared to those with a historical diagnosis or no diagnosis (percentage within the 1st quartile of income. Patients with current and historical cancer had and had more admissions to urban teaching Hospitals.

Women with a diagnosis of current or historical cancers had a higher prevalence of most comorbidities including hypertension, Type II diabetes, hypothyroidism and depression. There were increased incidence of depression amongst women with current and historical cancer.

Looking at the obstetric outcomes, patients with current cancer had a higher rate of preeclampsia, patients with historical cancer had an increased risk of pre-term birth and peripartum cardiomyopathy. Women with historical and current cancer have a higher incidence of PPH, but there was no difference in caesarean section rates between the groups. Women with haematological malignancies had a higher rate of fetal growth restriction, skin cancers had a higher rate of postpartum haemorrhage while patients with cervical cancer had a higher rate of delivery by caesarean section when compared to other cancer groups.

Our study is comparable to other evidence on patients with malignancies in pregnancy. There is an established link with preeclampsia leading to cancer in the future but little evidence on the converse. The study strength could have been improved with greater numbers. The NIS database changed from ICD-9 to ICD-10 limiting the patient numbers.