



Survival outcome of indigenous and non-indigenous women of Western Australia with breast cancer in relation to remoteness

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Background

Between 2001 and 2010 Indigenous Western Australian women who developed breast cancer (BrCa) were four times more likely to die of the disease than age-matched non-Indigenous women. With remoteness also an established factor in breast cancer mortality delineating the interplay between Indigenous status and remoteness could advise healthcare policy allowing tailored development of culturally specific services with appropriate geographical distribution to reduce the mortality risk.

Aim

The aim was to examine the impact of remoteness on survivals of Indigenous and non-Indigenous women with breast cancer.

Methods

Data were collected retrospectively and Indigenous status was defined by a woman identifying herself as Indigenous and populated from demographic data provided to the Western Australian State Cancer Registry following notification of a cancer diagnosis. A cohort of patients was selected comprising age- and remoteness matched Indigenous and non-Indigenous women in a 1:1 ratio, remoteness being defined by the ARIA system. In addition, the distance from the nearest treatment centre was calculated in kilometers. Overall survivals by Indigenous status and remoteness were calculated by Kaplan Meier analysis.

Results

The final cohort comprised 250 Indigenous and 261 non-Indigenous women. The results are divided into 5 and 10 yr overall survival, metastasis at diagnosis and survival outcomes, remoteness and survival analysis.

It was observed that those patients in both groups diagnosed with metastatic disease at diagnosis were from very remote communities, in Indigenous group the average distance was 1720km versus 1018km in Non-Indigenous group with p-value of 0.03.

A. Cross tabulations and independent t test analysis of Indigenous and non Indigenous cases vs variables

Comparison Variable	Indigenous n=250 (%)	Non-Indigenous n=261 (%)	P-Value
Age (years)	55.5	55.89	
Remoteness			0.46
- Very remote (> 1000km from Perth)	63 (25.2)	59 (22.6)	
- Remote (< then 1000km from Perth)	103 (41.2)	155 (59.3)	
- Metropolitan (Perth)	84 (33.6)	47 (18)	
Patients with Metastasis at Diagnosis	19 (7.6)	20 (7.6)	
Average distance (km) at diagnosis of De-Novo Metastatic Patients	1720km	1018km	0.03
Surgical Characteristics			0.21
- Mastectomy	128 (51.2)	127 (48.6)	
- WLE	99 (39.6)	110 (42.1)	
- No surgery	23 (9.2)	24 (9.1)	
Luminal Status			0.49
- Luminal A	111 (44.4)	151 (57.8)	
- Luminal B	68 (27.2)	56 (21.4)	
- Her2 positive	31 (12.4)	24 (9.19)	
- TNBC	40 (16)	30 (11.4)	
Nodal Status			0.65
- Node positive	118 (48.2)	101 (38.6)	
- Node Negative	132 (52.8)	160 (61.3)	

B. Survival Analysis at 5 years (Fig 1a) and at 10 years (Fig.1b) by Indigenous Status

Significant discrepancies in overall survival (OS) between Indigenous and non-Indigenous cohorts were observed, both at 5 years (Fig. 1a) and at 10 years as well (Fig. 1b). The 5- and 10-year overall survivals for Indigenous and non-Indigenous patients were 68 v 78%, p=0.013 and 55 v 68%, p=0.0025 respectively.

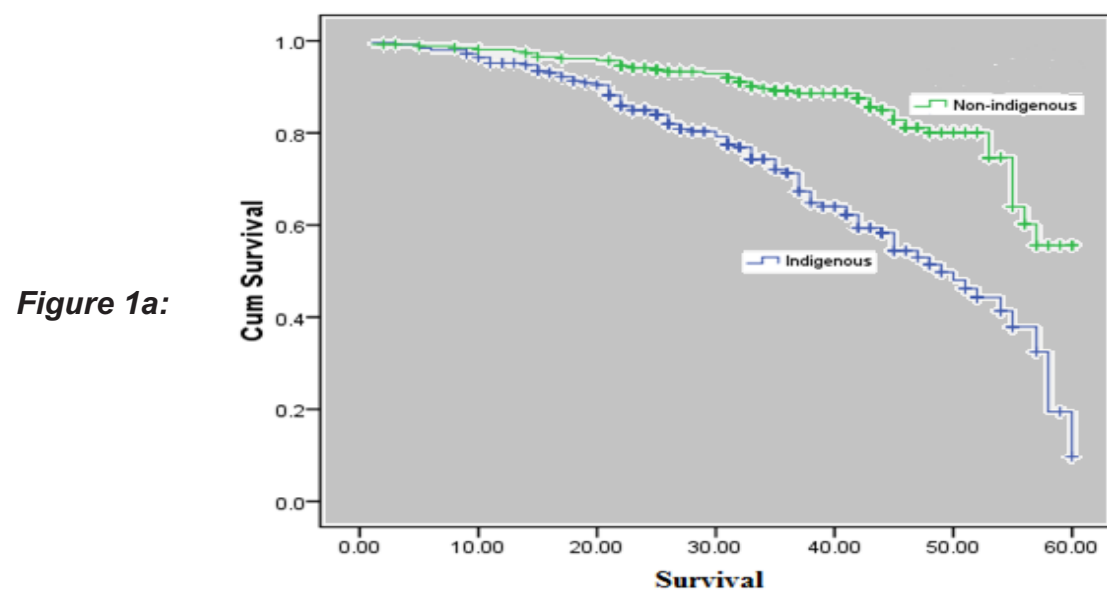


Figure 1a: Kaplan-Meier curves shows the 5 year survival is better in Non-Indigenous group. The difference between two group was 68 vs 78% respectively. When comparing the groups, the mean survival of Non-Indigenous group is 57 months (median not yet reached) and median survival is 49 months in Indigenous group. Log-rank p value = 0.013.

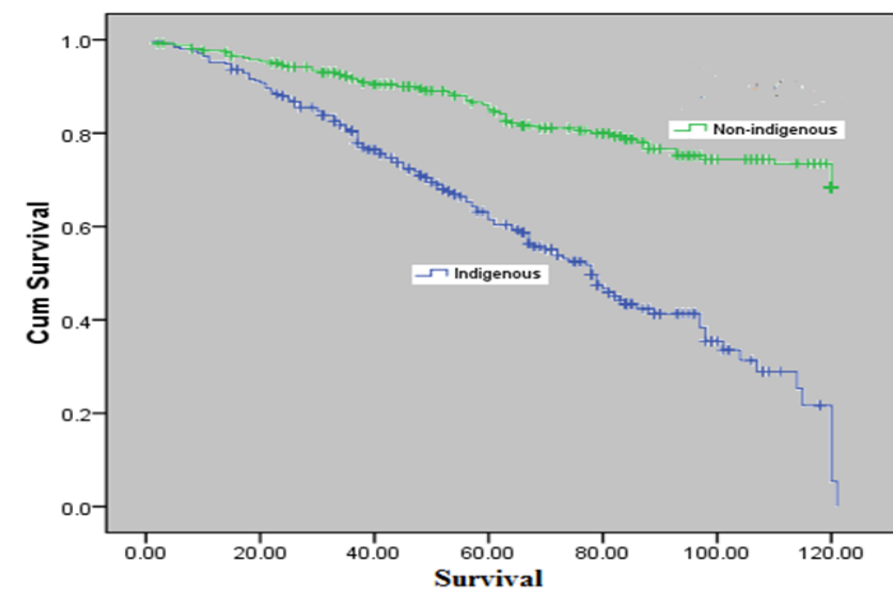


Figure 1b: Kaplan meier curve of 10 year survival analysis again favors the Non-Indigenous group. The difference between groups was 55 vs 68%. When comparing groups, the median survival of Indigenous group was 78 months and mean survival of Non-Indigenous cohort was 102 months (median not yet reached). Log-rank testing p value 0.0025.

C. Survival Analysis of De-Novo Metastasis diagnosis by Indigenous (Fig.2a) and Non-Indigenous Status (Fig.2b) and combined outcome between Indigenous and Non-Indigenous (Fig 2c)

Considering outcomes for those with metastatic disease at diagnosis, median survivals were also shorter for Indigenous patients, 39 v 56 months, p=0.026. The difference was stark in Indigenous cohort with de-novo metastatic disease, significant reduced survival time of 39 months vs 124 months with p-value of <0.0001 (Fig 2a) and similar trend in Non-Indigenous group demonstrated 56 vs 146 months with p-value <0.0001 (Fig 2b). The combined outcome favours Non-Indigenous cohort with better survival (Fig 2)

Metastatic disease at Diagnosis	Survival time (months)	P value
No (n=231)	124	<0.0001
Yes (n=19)	39	

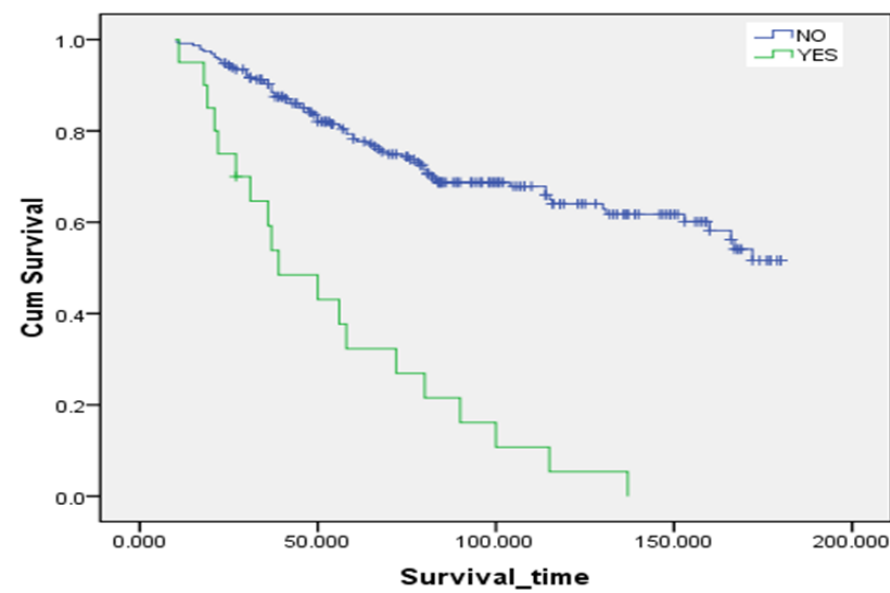


Figure 2a:

Figure 2a: Kaplan-Meier curve shows indigenous cohort who were diagnosed with de-novo metastatic disease have shorter survival duration compared to Indigenous group who didn't have de-novo metastatic disease. The median survival of de-novo indigenous group was 39 months and mean survival of value of other group was 124 months (median not yet reached) with log-rank p testing of <0.0001

De-Novo Metastatic Disease	Survival time (months)	P value
No (n=241)	146	<0.0001
Yes (n=20)	56	

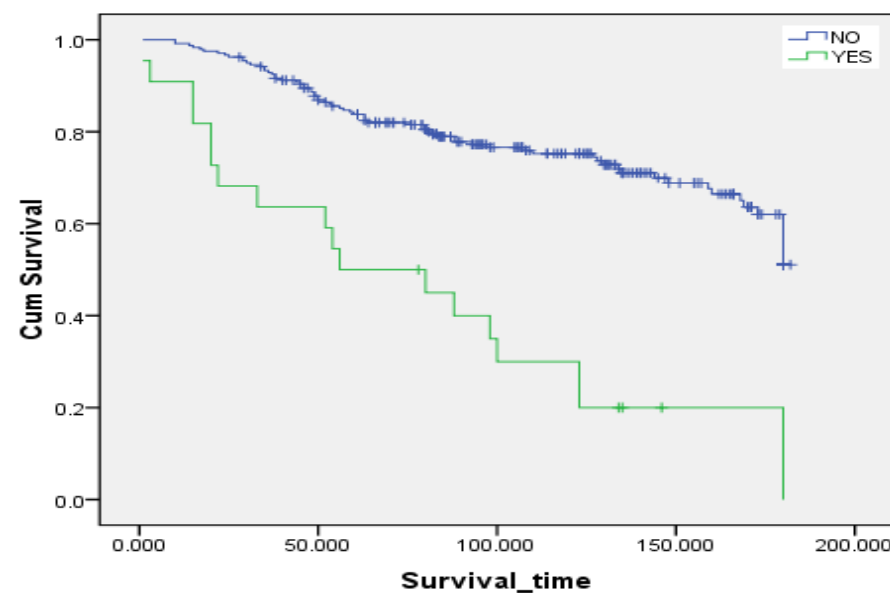


Figure 2b:

Figure 2b: Kaplan meier curve of Non-Indigenous patient with de-novo metastatic disease revealed significant reduction in survival time. The median survival was 56 months in de-novo metastatic patients compared with mean survival of 146 months in non-de-novo metastatic group. (median not yet reached) with Log-rank p-testing value <0.0001.

De-Novo Metastatic Disease	Median survival time (months)	P value
Indigenous (n=19)	21.00	0.03
Non-Indigenous (n=20)	33.00	

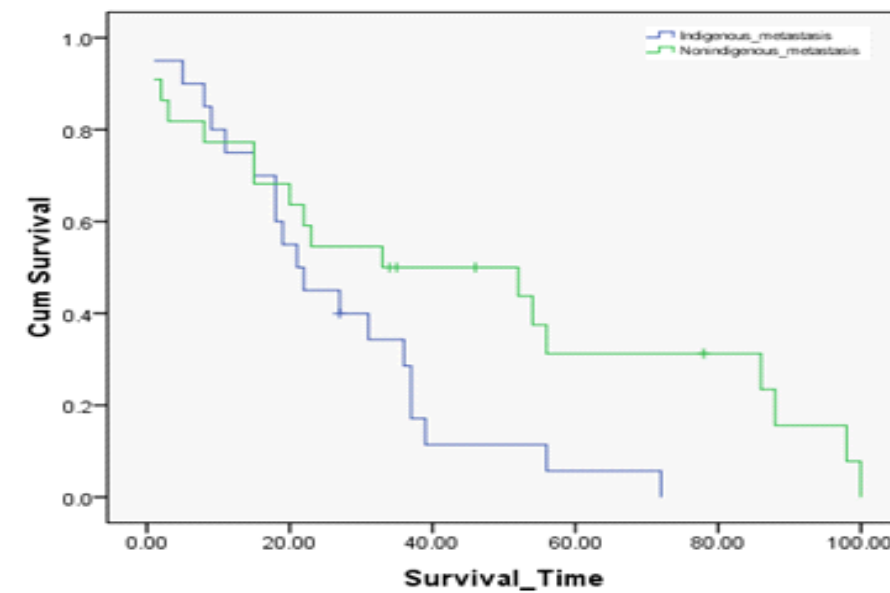


Figure 2c:

Figure 2c: The Kaplan-Meier curve shows Indigenous cohort with de-novo metastatic disease have poor outcome. Log rank testing p=0.03. When comparing the Indigenous group, the median survival of 21 months (95% CI : 14-27) and median survival of Non-Indigenous group was 33 months (95% CI : 29-61).

D. Survival analysis with Respect to Remoteness, Survival outcomes by Indigenous Status for, Fig 3a: Rural Vs Metropolitan, Fig 3b: Distance Related and Fig 3c: Combined with Non-Indigenous status

Indigenous patients showed marked impacts on survivals by geographical area of residence. Rural patients had substantially lower 10-year survivals (84 vs 96 months) than metropolitan-dwelling people, 75 v 56%, p=0.03 (Fig 3a). However, sub-categorizing rural patients into those less than or more than 1000km from a treatment centre showed comparable survivals at 10 years, p=ns (Fig 3b). In contrast, no significant difference was observed in non-Indigenous patients when survivals were analyzed by remoteness (p=0.10) or distance from treatment centres. Interestingly, the combined survival analysis of Indigenous and non-indigenous showed no impact on 10 year survival by geographical area of residence 90.8 vs 92.1 months, p= ns (Fig 3c).

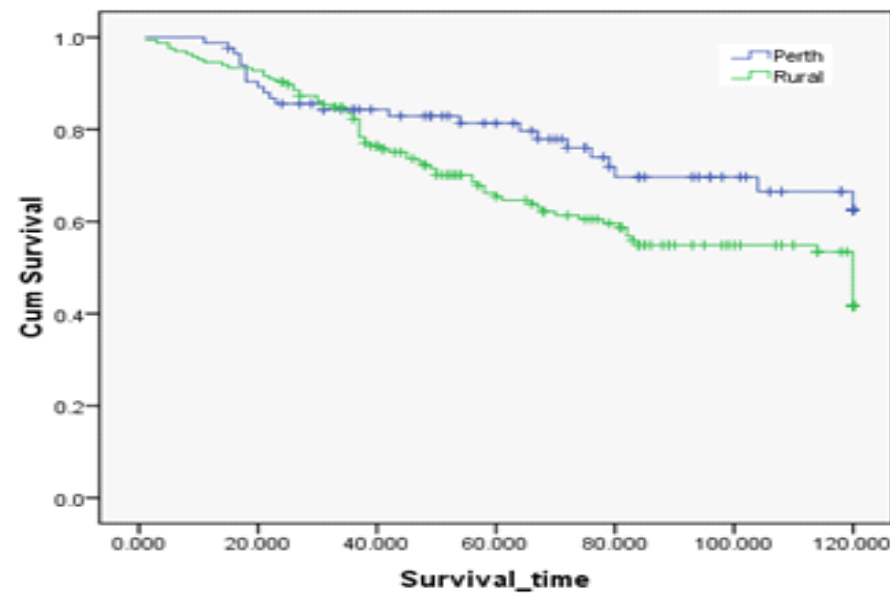


Figure 3a:

Figure 3a: Kaplan meir curve of remoteness related survival in Indigenous cohort shows living close to metropolitan area has better survival compared to population living in rural areas. When comparing the Metropolitan cohort the mean survival was 96.10 months (95 CI : 87-104, median not yet reach) and median survival of rural patients to be 84.14 months (95% CI: 78 to 91) with log-rank testing p=0.03

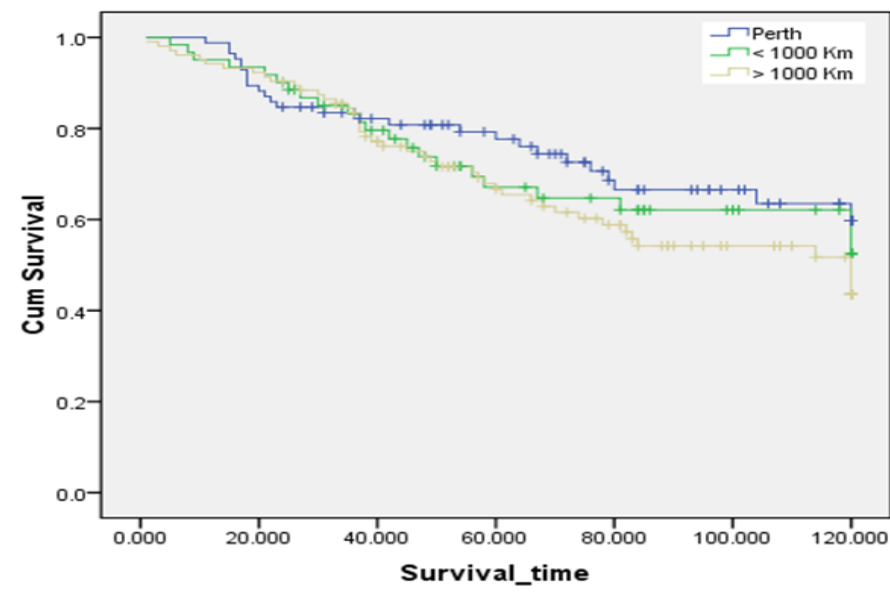


Figure 3b:

Figure 3b: Kaplan Meier curve shows no significant survival difference of Indigenous patients based on distant remoteness from treatment centre. The mean survival of Perth patients were 93.48 months (95% CI : 84-102, median not yet reached), less than 1000km group was 89.22 months (95% CI : 77-100, median not yet reached) and median survival of 85.2 months (95% CI : 76-93). Log-rank p-testing =0.31

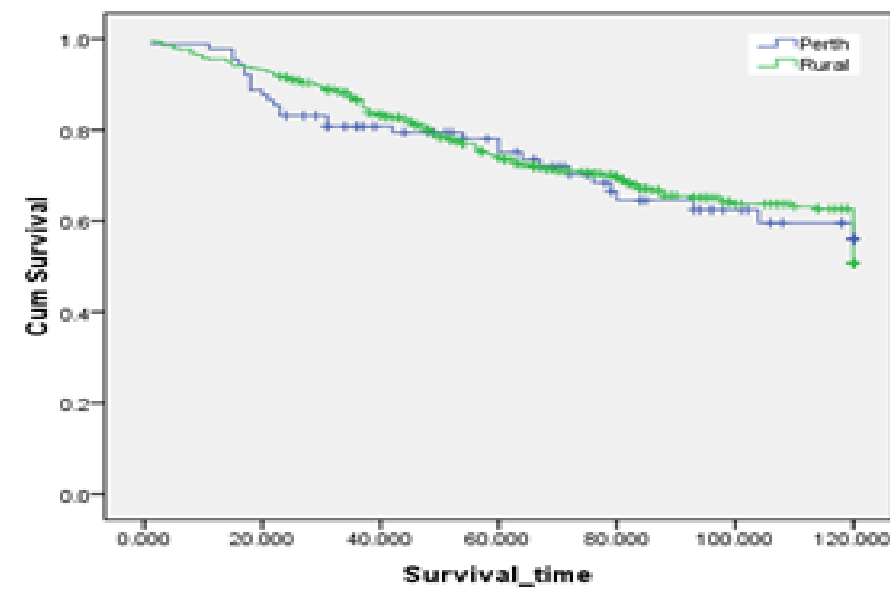


Figure 3c:

Figure 3c: Kaplan Meir curve demonstrated no difference in outcome in combined analysis of two groups for metropolitan and rural with mean survival of 90.8 months (CI 95% 81-99, median not yet reached) for Perth group and mean survival of 92.1 months (CI 95% 89-97, median not yet reached) for rural cohort with Log-rank p=0.92

Statistical Analysis

All the statistical analysis was done by using SPSS 20(Log-rank) and p value < 0.05 was considered to be significant. On the basis of observation and data type Mann Whitney U test for two groups and Kruskal Wallis test for more than 2 groups were used and survival curve was drawn by Kaplan Meier curve method.

Ethics Approval

This study was approved by the South Metropolitan Area Health Service Ethics Committee (RGS 451), the WA Department of Health Ethics Committee and the WAAHC Aboriginal Ethics committee (Application 838).

Conclusion

Indigenous women in Western Australia diagnosed with breast cancer have inferior survival outcomes overall as well as when diagnosed with metastatic disease relative to non-Indigenous peers. Considering remoteness within cohorts, only Indigenous patients showed disadvantage for rural relative to urban patients. A shift in public cancer policy is observed with more data supporting remoteness disadvantage in Indigenous cohort, resulting in operation of remote chemotherapy units and clinical oncology support. In terms of future perspective, studies are looking at treatment patterns and compliance in this area along with remoteness effect and hence this will form part of the study.

Disclosure

None to declare

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