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Original article

Association of ABO and Rh blood groups with breast cancer

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ABSTRACT

Objectives: The aim of this study was to determine the association of "ABO" and "Rhesus" blood groups with incidence of breast cancer.
Methods: In this study, we identified 70 research documents from data based search engines including "PubMed", "ISI-Web of Knowledge", "Embase" and "Google Scholar". The research papers were selected by using the primary key-terms including "ABO blood type", "Rhesus" blood type and "breast cancer". The research documents in which "ABO" and "Rhesus" blood types and breast cancer was debated were included. After screening, we reviewed 32 papers and finally we selected 25 research papers which met the inclusion criteria and remaining documents were excluded.
Results: Blood group "A" has high incidence of breast cancer (45.88%), blood group "O" has (31.69%); "B" (16.16%) and blood group "AB" has (6.27%) incidence of breast cancer. Blood group "A" has highest and blood group "AB" has least association with breast cancer. Furthermore, "Rhesus +ve" blood group has high incidence of breast cancer (88.31%) and "Rhesus –ve" blood group has least association with breast cancer (11.68%).
Conclusion: Blood group "A" and "Rhesus +ve" have high risk of breast cancer, while blood type "AB" and "Rhesus –ve" are at low peril of breast cancer. Physicians should carefully monitor the females with blood group "A" and "Rh +ve" as these females are more prone to develop breast cancer. To reduce breast cancer incidence and its burden, preventive and screening programs for breast cancer especially in young women are highly recommended.
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1. Introduction

"ABO" blood types are polymorphic, antigenic, genetic substances which are established on the Red Blood Cells (RBCs) surface and some other cells and tissues. In 1900, Karl Landsteiner discovered the "ABO" blood group. "ABO" and "Rhesus" blood types are the major human blood type system with principal importance in transfusion medicine (Siransy et al., 2015). Blood groups are characterized by small carbohydrate epitopes depending on the presence or absence of gene "A" and "B" positioned on 9q34 chromosome (Farhud and Yeganeh, 2013). "ABO" blood type system comprises of four major "ABO" phenotypes "A", "B", "O", and "AB". The "ABO" blood type system is allied with a number of illnesses including stomach and duodenal ulcer (Tanikawa et al., 2012), Hepatitis-B (Siransy et al., 2015), vascular diseases (Zakai et al., 2014), abdominal aortic aneurism (Fatic et al., 2015) and type 2 diabetes mellitus (Meo et al., 2016) and cancers (Gates et al., 2011; Wolpin et al., 2009). The epidemiological literature established the liaison among "ABO blood group" and the risk of breast cancer, although, conclusions were inconsistent and were not evidently clarified. Breast cancer occurrence rates are increasing among Asian women (Huang et al., 2016). Breast cancer is most common type of malignancy and the main cause of mortality in women globally. The high-

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Table 1
Association of "ABO" blood groups with breast cancer.

Authors and year	Study type	Blood groups	Breast cancer (%)
Cihan (2014)	Retrospective	"Blood group-A"	63
		"Blood Group-O"	17.6
		"Blood Group-B"	14.3
		"Blood group-AB"	5.1
Sahar et al. (2013)	Cross sectional	"Blood Group-A"	64
		"Blood Group-O"	18
		"Blood Group-B"	9.6
		"Blood Group-AB"	8.4
Akhtar et al. (2010)	Cross sectional	"Blood group-A "	42.4
		"Blood group-B"	30.3
		"Blood group-O"	21.2
		"Blood group-AB"	6.1
Stamatakos et al. (2009)	Cross sectional	"Blood group-A"	47.59
		"Blood group-O"	33.13
		"Blood group-B"	13.85
		"Blood group-B"	5.42
Yuksel et al. (2012)	Cross sectional	"Blood group-A"	44
		"Blood group-O"	32
		"Blood group-B"	16
		"Blood group-AB"	8
Aly et al. (2014)	Cross sectional	"Blood group-A"	53.1
		"Blood group-O"	21.8
		"Blood group-B"	17.5
		"Blood group-AB"	7.5
Ronco et al. (2009)	Cross sectional	"Blood group-O"	54.4
		"Blood group-A"	36.9
		"Blood group-AB"	6.7
		"Blood group-B"	2.00
Flavarjani et al. (2014)	Case–control study	"Blood group-O"	42.20
		"Blood group-A"	28. 9
		"Blood group-B"	23.70
		"Blood group-AB"	5.20
Shiryazdi et al. (2015)	Cross sectional	"Blood group-A"	65.5
		"Blood group-O"	21.4
		"Blood group-B"	9.0
		"Blood group-AB"	4.0
Gates et al. (2012)	Cross sectional	"Blood group-O"	43
		"Blood group-A"	36
		"Blood group-B"	13
		"Blood group-AB"	8
Yu et al. (2012)	Cross sectional	"Blood group-O"	43
		"Blood group-A"	38
		"Blood group-B"	14
		"Blood group-AB"	5
Payandeh et al. (2015)	Cross sectional	"Blood group-A"	43.42
		"Blood group-O"	31.57
		"Blood group-B"	15.78
		"Blood group-AB"	9.21
Saxena et al. (2015)	Retrospective	"Blood group-A"	36.89
		"Blood group-B"	32.52
		"Blood group-O"	23.30
		"Blood group-AB"	7.28
Solak et al. (2011)	Retrospective	"Blood group-A"	28.8
		"Blood group-O"	31.57
		"Blood group-B"	9.8

est incidence was observed in the age groups 45–65 and 80–85 (Rafiemanesh et al., 2016). The occurrence of breast cancer has been associated with many factors such as age, history of menopause, inherent, environment, diet and obesity. In the current biomedical literature, limited documents are present to establish correlation of "ABO" and "Rhesus" blood groups with breast cancer. Therefore, the aim of this study was to find out the potential link among "ABO" and "Rhesus" blood groups with breast cancer.

2. Research methodology

2.1. Selection of studies

We searched and identified 70 research papers from the databases including "PubMed", "Institute of Scientific Information" (ISI) "Web of knowledge", "EMBASE" and "Google Scholar". Two investigators searched, reviewed and collected the literature, using keywords "ABO blood groups", "Blood group A", "Blood group B", "Blood group AB", "Blood group O" "Rhesus +ve" "Rhesus –ve" and "breast cancer". The abstracts of the research articles were reviewed to determine the aptness for the research articles. All articles in which "ABO", "Rh+ve" and "Rh−ve" blood groups and breast cancer were reported were considered appropriate for inclusion without limitations on research documents and language of the publications. We reviewed the 32 papers and finally 25 publications that harmonized our criteria were comprised and remaining papers were excluded.

2.2. Data extraction

The eligibility of the research papers were considered by two investigators and differences were determined by another mem-

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