CHAPTER 1: INTRODUCTION

1.1 BRCA Mutations Associated Cancers

BRCA-1 (breast cancer gene 1) and BRCA-2 (breast cancer gene 2), found in human genes, are responsible in producing tumor suppressor proteins. These normal genes play an important role in repairing DNA double-strand breaks via homologous recombination (HR), a mechanism that perfectly repairs any damaged DNA. The cysogenic locations of BRCA-1 (Figure 1.1) and BRCA-2 (Figure 1.2) are at 17q21 (Hall et al., 1990; Miki et al., 1994) and 13q12.3, respectively (Wuensiek et al., 1996, 1997). Mutations and alterations in the genes may result in genetic instabilities that lead to increased risk of cancer development, such as breast cancer, ovarian cancer, prostate cancer and other cancers (Shi et al., 2002). Mutations in these genes have been linked with 50-90% of hereditary breast cancer (HBC) (Ponder et al., 2010) and 5-10% of other breast cancers (Capozza, Previsic, & Testi, 2006), most hereditary ovarian cancers especially high grade serous cancer (HGSOC) type, and in 15% of prostate cancer in men (Fava et al., 2014).

Hereditary cancer is a cancer that develops from mutated genes of a biological parent to offspring or siblings. Once mutation is inheritable either from a mother or a father that is passed on to their sons or daughters, treated as germline mutations. Thus there is a 50% chance for a child to inherit a mutated gene, also makes them susceptible to develop colorectal cancer and pancreatic cancer (Drujan & Van Loon, 1998). As reported by the University of Cambridge in 2005, British women with BRCA-1 mutations aged above 70 have 90% and 20% are at risk in developing breast cancer and ovarian cancer. Similarly, a 40% chance of breast cancer development and a 15% chance for ovarian cancer. 