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Pre-operative anxiety and breast biopsy: A systematic review of empirical studies

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ABSTRACT. Lo scopo della presente review è stato identificare alcune variabili psicosociali in grado di influenzare i livelli di ansia nelle donne sottoposte a biopsia al seno. È stata prodotta una review basata sui criteri PRISMA con un campione finale di 9 studi empirici pubblicati tra il 1996 ed il 2015. I risultati ci permettono di individuare le seguenti dimensioni connesse con l'ansia pre-operativa: l'Ansia di Tratto, la presenza di Eventi Cronici Stressanti, il Worry e l'Incertezza circa i risultati, il Waiting Time, sia la Qualità della Comunicazione che il Supporto Percepito dall'équipe.

SUMMARY. Different studies do not provide clear evidence with respect to the variables that are able to influence pre-operative anxiety level in women undergoing breast biopsy. The purpose of this review was to systematically identify variables related with pre-operative anxiety level in breast biopsy context. A PRISMA-guided systematic review was run from July 2015 to September 2016, with a final sample of 9 empirical studies published between 1996 and 2015. Results highlighted that pre-operative anxiety is connected with specific psychosocial variables. The factors that were found to influence breast biopsy related anxiety levels seems to be the levels of Trait-Anxiety in the patients, the presence of Chronic Life Stress, the Worry and Uncertainty about the Result, the Waiting Time, the quality of the communication with the staff members, and the quality of the Support provided by the operators. Many of these variables could be taken as target dimensions for psychological interventions aiming to limit anxiety in women undergoing breast biopsy.

Keywords: *Breast cancer, Biopsy, Pre-operative anxiety, Mammography*

INTRODUCTION

Recent studies estimate that one over eight women in U.S. is at risk of developing breast cancer. (DeSantis, Ma, Bryan & Jemal, 2014). Breast cancer incidence is double that any other cancer type in hight income countries (Vainio & Bianchini, 2002). On the other hand, mortality due to breast cancer has been largely reduced in the last decades, at least partially due to the progress of diagnostic tools and prevention programmes (Khan et al., 2017). Effective methods are indeed available to enhance early diagnoses of breast cancer, first of all mammography together with ultrasound and resonance (Lauby-Secretan et al., 2015). In particular mammography together with biopsy allows to characterize the cancer type at the morfological as well as at the biological level (Vainio & Bianchini, 2002). There is a general consensus among researchers that mammography can affect the psychological well-being of the patients and that it can be associated with psychological distress both in the patients and in their caregivers (Flory & Lang, 2011; Humphrey et al., 2014; Lebel et al., 2003; Miller et al., 2013; Novy, Price, Huynh & Schuetz, 2001; Pineault, 2007; Pritchard, 2009; Soo et al., 2014; Ubhi, 1996). Different studies were focused on the psychological consequences of biopsy under surgery, such as anxiety and physical pain (Aust, et al., 2016; Feig, 2004; Fekrat, Sahin, Yazici & Aypar, 2006; Masood, Haider, Masood & Alam, 2009). Other studies have considered, among other variables, the degree of invasiveness of different diagnostic procedures and concluded that anxiety is associated with the uncertainty of results more that with the type of surgical procedure that is applied (Flory & Lang, 2011; Miller et al., 2014). An exploration of the psychological variables that are associated with higher of anxiety in the diagnostic phase was performed by Novy et al., 2001, Drageset & Lindstrøm, 2005 and Harding, 2014, while other studies explored pre/post biopsy anxiety levels with regards to the quality of communication with the health care providers, concluding that this is a relevant factor in reducing anxiety levels (Miller, et al., 2013; Pineault, 2007). Furthermore different characteristics of the staff members were found to have different effects on the quality of the communication and on the patient adherence to subsequent treatments (De Vries et al., 2014). Finally the relationship between anxiety and waiting time for the results of the breast biopsy was also explored (Ubhi et al., 1996). A rather long series of empirical investigations have tried to provide an assessment of pre-operative anxiety before breast biopsy (Andrykowski et al., 2002; Balmadrid et al., 2011; Drageset & Lindstrøm, 2005; Flory & Lang, 2011; Harding, 2014; Humphrey et al., 2014; Miller et al., 2013; Novy et al., 2001; Pineault, 2007; Scott, 1983; Ubhi et al., 1996;). Scott 1983, has examined three variables: *Anxiety*, *Reasoning Ability* in Stressful Condition and *Critical Thinking Ability*, this last being critically related to decision making abilities in stressful situations (Moon, 2008). *Anxiety* levels were found to reach very high levels, comparable to those found in psychiatric patients suffering from acute anxiety crises. Similarly, Hughson, Cooper, McArdles & Smith (1988) found that pre-operative anxiety in women undergoing breast biopsy is much higher than what found in other groups of patients undergoing routine surgery. In an attempt to explore the variables that are potentially able to influence the distress level of patients undergoing breast biopsy, Northouse, et al. (1995), considered six predictive dimensions: *Social Support*, *Marital Satisfaction*, *Family Functioning*, *Hope*, *Concurrent Stress Factors*, *Uncertainty*. All of these were found to influence the pre-operative distress level in a multivariate design. More in general, the detection and evaluation of the difficulties that patients may experience in adjustment to cancer are important in order to propose specific support strategies: treatment adherence and adjustment to cancer can benefit, among other interventions, from an early assessment of the anxiety levels, and from the treatment of excessive anxiety (Hulbert-Williams, Neal, Morrison, Hood & Wilkinson, 2012). In 1997 the construct of *Waiting Game* (Poole, 1997) has been proposed as a suitable way to describe the peculiar experience of being waiting for the results of a relevant diagnostic procedure and outcome. More recently the experience of waiting to undergo a breast biopsy has been specifically explored (Lebel et al., 2003). The experience was evaluated according to sociodemographic factors and to distress related variables, such as *Depression*, *Anxiety*, *Intrusive Thought*s, *Waiting Game* and *Perceived Risk*. Many subjects were found to experience high levels of *State Anxiety*, *Depression* and *Intrusive Thoughts*, althought none of these variables was able to correlate to the time interval to biopsy (Lebel, et al., 2003). However qualitative data highlighted that the perceived anxiety level increased during the wait. Therefore the relevance of the *Waiting Game* construct is not clear at the moment.

Finally a recent study has explored the psychological needs, that are expressed by women with breast cancer in different phases of their illness. The needs, in terms of *Social*

Support, *Informations*, *Health Care Facilities*, were found to be maximal before biopsy in patients with a suspect of breast cancer (Liao, Chen, Chen & Chen, 2010).

Overall the different studies do not provide clear evidence with respect to the variables that are able to significantly influence pre-operative anxiety level in women undergoing breast biopsy. Therefore a systematic review of the prospective and comparative studies and randomized and not randomized trials that explore this relationship in women aged between 18 and 84 undergoing breast biopsy is proposed here. Only studies using validated assessment tools will be considered in order to reduce the Cochrane risk of bias. The selected studies have considered the relationship between:

- pre-operative/post-operative anxiety and quality of communication;
- pre-operative/post-operative anxiety and related psychological variables;
- pre-operative anxiety and degree of invasiveness of the surgical technique;
- pre-operative/post-operative anxiety and waiting time to outcome.

METHODS

In order to achieve the mentioned goal, the following informations have been extracted from the selected articles (see Table 1):

- type of design of research used;
- type of participants (18-84 years-old women);
- aim of the study;
- method;
- results (see Table 2).

Selection criteria and search strategy

The articles have been selected according to the following inclusion criteria:

1) descriptive studies in English, randomized and non-randomized, prospective, longitudinal, correctional and comparative studies that valued the anxiety level in preoperative phase in an oncological diagnosis context;
2) samples of 18-84 years-old women undergoing breast biopsy. Male patients and other procedures have been excluded to allow greater homogeneity among studies, in order to provide a better context-specific overview;
3) studies that: (a) have evaluated the preoperative anxiety level pre- and post-biopsy with respect to the quality of the received communication; (b) pre- and post-biopsy anxiety level, and psychological variables considered; (c) pre-biopsy anxiety level and type of surgery procedure used (invasive *vs* non-invasive); (d) pre- and post-biopsy anxiety level related to the awaiting period of the results;
4) measured outcome: (a) presence of significative pre- and post-biopsy anxiety levels; (b) the impact of the waiting time for results on anxiety; (c) possible consequences of preoperative anxiety experienced during the diagnostic phase and in the following months, and possible correlations with other psychological variables.

A literature research was run, from July 2015 to September 2016 in order to retrieve the articles published in electronic databases. The PRISMA guidelines were used. The search engines used were PUBMED, SCIENCE DIRECT and GOOGLE SCHOLAR. The terms used for research were: (a) anxiety, (b) anxiety and breast biopsy, (c) preoperative anxiety, (d) preoperative anxiety concept. The research found 3261 articles, 3161 of which were excluded and the remaining 100 were screened by title and by abstract, basing on the mentioned keywords.

Data abstraction

Studies that fulfill eligibility criteria were examined by the authors. Two authors (Miraglia Ranieri and Pelagotti.) have extracted the information and then compared them to each other. For each article the following aspects were considered: (1) the publication year, (2) the participants' characteristics, (3) the type of research design, (4) the aim of the study, (5) the instruments used, (6) the results. Any disagreement about the 9 selected articles was consensually resolved.

Study selection

100 abstracts have been reviewed, and every abstract was analyzed in terms of: (a) design of the study, (b) type of procedure, (c) type of participants, (d) results. Within this first selection, according to the criteria described above we have extracted and examined 54 research papers. At this stage 44 were excluded because they considered male participants,

Table 1 – Description review table

References	Design	Sample	Methodology	Aim
Ubhi et al. (1996) England	Comparative	102 UBB	Standard psychological self-report	To compare the level of anxiety in a group of women who underwent biopsy with immediate results and a group of women that the result will be announced later.
Novy et al. (2001) USA	Comparative	102 UBB	Self-report of demographic and medical items Standard psychological self-report	To assess the level of anxiety before the breast biopsy and possible correlations influential.
Drageset & Lindstrøm (2005) Norway	Correctional	117 UBB	Socio-demographic questionnaire Standard psychological self-report	To examine the relationships between demographic characteristics, social support, anxiety, coping and defence among women with possible breast cancer.
Pineault (2007) Canada	Exploratory	631 UBB	Standard psychological self-report	To describe the experience of anxiety in women after an abnormal mammogram are waiting for diagnosis and explore the social support of these patients at this time.
Flory & Lang (2011) Israel	Randomized	112 UBB	Standard psychological self-report	To assess stress levels in women who are waiting for breast biopsy and do not know the diagnosis with 2 groups of women undergoing invasive procedure that know their diagnosis.
Miller et al. (2013) USA	Prospective	138 UBB	Standard psychological self-report	Assessing anxiety in relation to the communication received in the context of ultrasound-guided breast biopsy.
Miller et al. (2014) USA	Correctional	50 UBB	Socio-demographic questionnaire Standard psychological self-report	Investigating whether anticipatory distress before breast biopsy would correlate with biopsy-related outcomes (pain and physical discomfort during the biopsy) and if whether type of distress (anxiety, worry about the procedure, worry about biopsy results) would differentially relate to biopsy-related outcomes.
Harding (2014) USA	Correctional	128 UBB	Socio-demographic questionnaire Standard psychological self-report	To identify the incidence of distress and evaluate associated factors during the breast diagnostic period.
Balmadrid et al. (2015) USA	Correctional	140 UBB	Socio-demographic questionnaire Standard psychological self-report	Explore how time from breast biopsy recommendation to biopsy procedure affected pre-biopsy anxiety and whether the relationship between wait time and anxiety was affected by psychosocial factors.

Legenda. UBB = Undergoing breast biopsy (abbreviations for type procedure).

Table 2 – Results review table

References	Results
Ubhi et al. (1996)	Results point out the positive effect of an immediate communication on anxiety levels, mostly in benign outcome.
Novy et al. (2001)	Study highlights relevance of trait anxiety. The 96% of women-patients reported level of trait anxiety higher than general population.
Drageset & Lindstrøm (2005)	Anxiety level wasn't correlated with socio-demographic variables, but seem to me moderate by influence of Coping type. A Strumental Coping seems to be positive related with perceived social.
Pineault (2007)	Women showed high level of anxiety in every moment of diagnosis, and level remained constant during all period from biopsy to communication results.
Flory & Lang (2011)	Women subjected to biopsy showed higher levels of anxiety than women subjected to an invasive chirurgical procedure. Probably variable as uncertainty of outcome can be considered influential on anxiety more than the procedure.
Miller et al. (2013)	A best perception of communication with radiologist was been associated with a low level of anxiety before biopsy. Levels of anxiety seems to decrease after the diagnostic exam.
Harding (2014)	Trait anxiety has an important impact on state anxiety. Medical history and previous biopsy didn't have impact on level of perceived distress.
Miller et al. (2014)	Distress before biopsy was correlated with pain and physical discomfort.
Balmadrid et al. (2015)	Variable Chronic Life Stress (CLS) seems to be important. High level of CLS influenced level of anxiety.

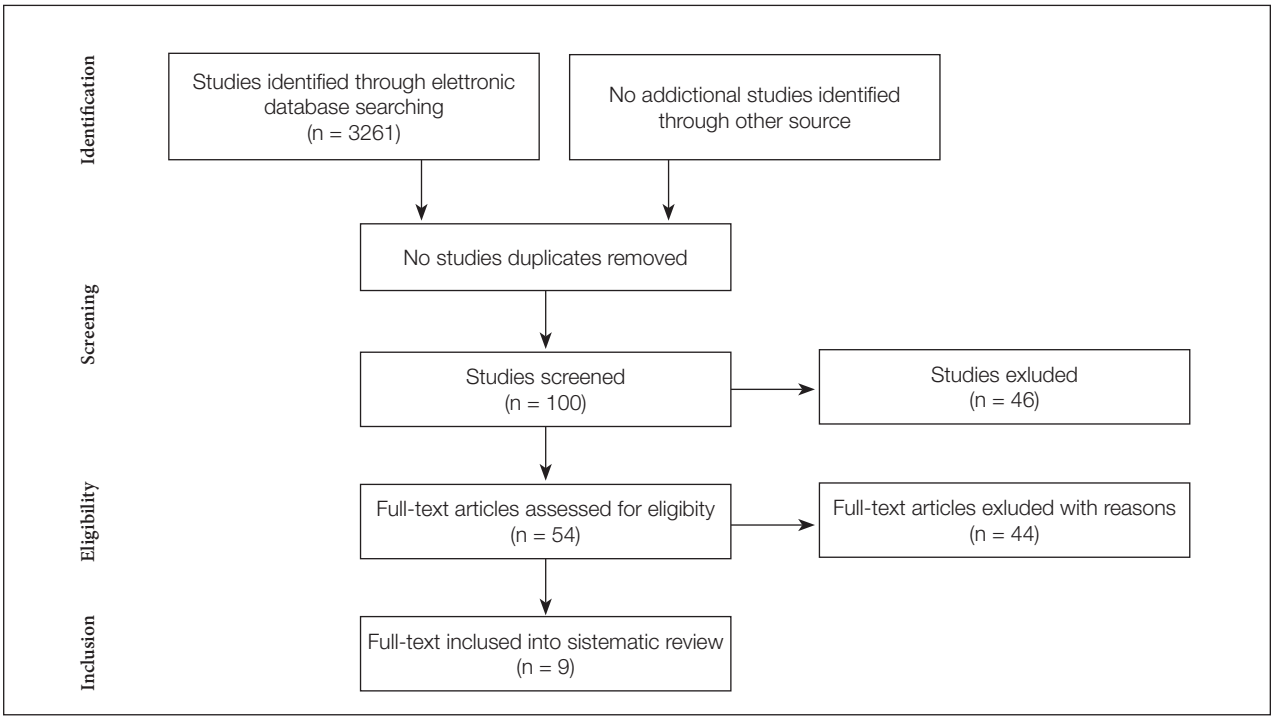
other type of biopsy, or due to the fact that they were not written in English. Therefore only 9 of the 54 selected articles, published between 1996 to 2015, resulted eligible basing on our including criteria and were included in the final review (see Figure 1).

Study characteristics

Table 1 shows the characteristics of the nine reviewed documents. Of these nine, one is a prospective study (Miller et al., 2013), two are comparative studies (Novy et al., 2001; Ubhi et al.,1996), one is a randomized trial (Flory & Lang, 2011), one is an explorative research (Pineault, 2007), four are correlational studies (Balmadrid et al., 2015; Drageset & Lindstrøm, 2005; Harding, 2014; Miller et al., 2014). Five of the nine studies were conducted in US, one in England, one in Israel, one in Norway and one in Canada. The selected studies evaluated different types of interactions: (a) two studies (Miller et al., 2013; Pineault, 2007) evalued the anxiety level pre- and post-biopsy and the quality of the received communication. In particular in these studies the quality of communication was evaluated in terms of the clarity of the information provided, including the details of the risks involved in the proposed procedure, (b) studies that evaluetd the pre-biopsy anxiety level and correlated psychological variables (Balmadrid, et al., 2015; Drageset & Lindstrøm, 2005; Harding, 2014; Novy et al., 2001), (c) studies that considered the pre-biopsy anxiety level and the adopted surgery procedure (invasive vs not-invasive) (Flory & Lang, 2011), (d) studies that have valued the pre- and post-biopsy anxiety level and the awaiting time of the results (Ubhi et al., 1996).

In the selected studies, different scales of measure were used to assess the *Preoperative Distress* of the participants. *Anxiety* was measured in a study with the *Breast Cancer Anxiety Indicator* (*BCAI*) (Pineault, 2007), in another study

Figure 1 – Flow chart of the systematic review



with the subscale *Anxiety* of the short version of the *Profile of Mood States* (*SV-POMS*) (Miller et al., 2014), in two studies with the *Hospital Anxiety and Depression Scale* (*HADS*) (Harding, 2014; Ubhi et al., 1996), in seven studies with the *State Trait Anxiety Inventory* (*STAI*) (Balmadrid et al., 2015; Flory & Lang, 2011; Harding, 2014; Miller, 2013; Novy et al., 2001; Ubhi et al., 1996). *Depression* was measured in two studies with the *Center for Epidemiologic Studies Depression Scale* (*CES-D*) (Flory & Lang, 2011). For more specific measures, such as the impact of events, stress in a study the *Perceived Stress Scale* (*PSS*) (Flory & Lang, 2011) was used, in another study authors referred to the *Psychological Consequences of Screening Mammography* (*PCQ*) (Pineault, 2007). For measurements of the *Quality of communication* between physician and patient, and for social support, different scales were used: the *Multidimensional Scale of Perceived Social Support* (*MSPSS*) (Harding, 2014) and *Medical Outcome Study* (*MOS*) *Social Support Survey* (Balmadrid et al., 2015). To assess the *Satisfaction of the care* in a study was used the *Patient Satisfaction Questionnaire* (*PSQ-18*) (Harding, 2014). In order to assess the worry about the procedure and about the results and the discomfort during biopsy the *Visual Analog Scale* (*VAS*) was used (Miller et al., 2014). Moreover for other specific assessment the adopted tools were the *Resilience Scale* (*RS-14*), the *Meaning in Life Questionnaire* (*MLQ*), the *Brief Coping Inventory* (*Brief COPE*) (Harding, 2014), the chronic life stress *Questionnaire and the Traumatic life events scale* (Balmadrid et al., 2015).

Risk of bias in the included studies

When summarizing all the risks of bias according to Cochrane's criteria (see Table 3), among the nine selected study, seven were evaluated at low risk for the selection bias, two instead were considered at high risk. Infact these two studies do not describe their method of data collection. Of the nine evaluated studies six were considered at low risk for the performance and the detection bias, and three at high risk. Six studies were valued at high risk for the Attrition Bias and all nine at low risk for the selective reporting bias. All the studies used standardized instruments. Given the characteristics of the theme analyzed in the review, the presence/absence and the influence of socio-demographic variables reported in the studies was considered as another bias: eight studies resulted at low risk and one at high risk of bias (see Figure 2).

Table 3 – Analysis of risk of bias in studies examined by the review, according to Cochrane's criteria

	Selection bias		Performance and detection bias		Attrition bias		Selective reporting		Other bias	
	Risk	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**
Ubhi et al. (1996) England	H	Randomized was not reported	L	A questionnaire was administered	H	Partial justification for attrition	L	Disclosure was measured by self -report questionnaire	H	Socio-demographic variable influences were not accounted for.
Novy et al. (2001) USA	H	Participants were recruited from center on the day of the biopsy, a nurse coordinator discussed this study with the patient	H	No randomization and no blinding, questionnaires were administered	L	Attrition was accounted for	L	Each variable was rated	L	Socio-demographic variable influences were accounted for.
Drageset & Lindstrøm (2005) Norway	L	The patients were participants in a national mammography screening program, or were referred by their private physician	L	Self-report questionnaires was administered	H	Attrition was not explained	L	Each variable was rated	L	Socio-demographic variable influences were accounted for.
Pineault (2007) Canada	L	Women involved in the QBCSP who had abnormal screening mammogram test results were contacted to take part in the study	L	The questionnaires were distributed by mail	H	Attrition was not explained.	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.
Flory & Lang (2011) Israel	L	Participants were recruited through the radiology department of an urban, tertiary, university-affiliated Beth Israel Deaconess Medical Center	L	Patients were also asked to fill out four questionnaires prior to their randomization	H	Attrition was not explained	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.
Miller et al. (2013) USA	L	Women were invited to participate in this prospective study on day of their procedures by criteria matching	L	Self-report questionnaires were administered	L	Attrition was accounted for	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.

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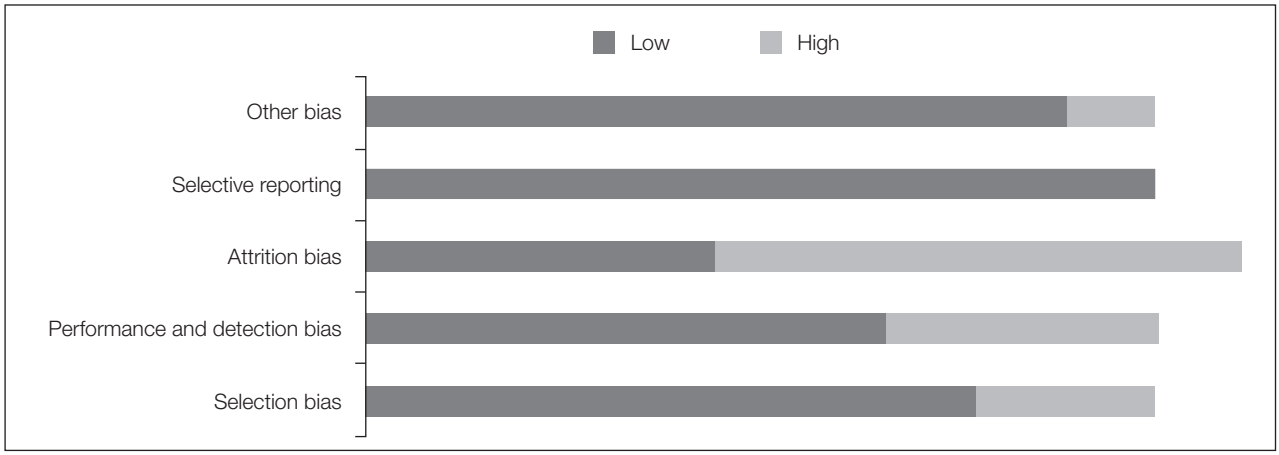
	Selection bias		Performance and detection bias		Attrition bias		Selective reporting		Other bias	
	Risk	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**	**Risk**	**Explanation**
Miller et al. (2014) USA	L	Patients were referred to the study by their radiologist and recruited by a research assistant on the day of their breast biopsy, prior to the biopsy	H	Blinding was not reported, Self-report questionnaires were administered	H	Attrition was not explained	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.
Harding (2014) USA	L	Partecipants were recruited from three outpatient radiology clinic at two community hospitals in Ohio and one cancer center in West Virginia	H	Blinding was not reported, women were identified from radiology department schedules	H	Attrition was not explained	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.
Balmadrid et al. (2015) USA	L	Women were invited to participate in this study on day of their procedures by criteria matching	L	Self-report questionnaires were administered	L	Attrition was accounted for	L	Disclosure was measured by self-report questionnaire	L	Socio-demographic variable influences were accounted for.

Figure 2 – Risk of bias ratings for the studies included in the quantitative analysis



RESULTS

Cumulative data results

The selected articles have analyzed different numerical samples. On average, the sample size is 114 participants (Balmadrid et al., 2015; Drageset & Lindstrøm, 2005; Flory & Lang, 2011; Harding, 2014; Miller et al., 2013; Novy et al., 2001; Pineault, 2007; Ubhi et al., 1996;), Miller et al., (2014) have recluted only 50 participants. All nine selected studies examine women undergoing or waiting for breast biopsy according to our selection criteria.

(a) Anxiety and Staff Communication

The study by Miller et al., (2013) evaluates the interaction between the pre- and post-biopsy anxiety level and the Perception of the Communication delivered by medical staff to patients. Miller, et al. (2013) have: (a) measured the patient's anxiety in pre- and post-biopsy phase; (b) examined the characteristics associated to patients' anxiety; (c) examined if the perceived physician-patient communication is associated with patients' anxiety. Researchers have confirmed that the high level of anxiety during the ultrasound-guided biopsy procedure is associated with the following factors:

- the procedure itself, since an anxiety decrease is observed after the diagnostic exam, although anxiety still remains at a high level, probably due to the uncertainty about the results;
- the patients' perception of the communication with radiologists, in terms of the clarity of the information provided: a frank communication of the details of the risks involved in the proposed procedure was associated with a low level of pre-biopsy anxiety;
- having had a previous experience of breast biopsy improves communication with radiologists, maybe because it allows to better understand the experience and the suggestions, but this condition does not appear to be associated to a low anxiety level;
- the patients' perception of the quality of the radiologist's communication seems to have a peculiar relationship with anxiety levels. The risk of receiving a diagnosis increases anxiety levels; furthermore, a higher perceived risk of receiving cancer diagnosis was found to be associated with lower perceived quality of the communication from the part of the radiologists. Thus the relationship between perceived communication and anxiety levels seems to be affected by the 'Uncertainty about the Diagnosis' variable.

In study conducted by Pineault (2007) women showed anxiety during each one of the diagnostic phases, but anxiety was exacerbated during the procedure. When the mammography screening was declared abnormal, 48% of women resulted to be very anxious, meanwhile more than half of them recorded the same anxiety levels, both while waiting for the test (51%) and while waiting for the results (53%). Anxiety was amplified by the communication of the need for further investigations such as biopsy: in this situation 62% of women appeared to be very or extremely anxious. Moreover, the anxiety level remained constant throughout the waiting period for the biopsy, until the results were obtained (Pineault, 2007). The results of the study also revealed that the emotional support of friends and family members is comforting but it does not reduce the patients' anxiety level. The satisfaction about the social support offered by health care professionals appears to be more able to reduce of the anxiety level during the diagnostic phase.

These two studies underline that there is a specific increase in anxiety levels when the need for further investigations by biopsy is communicated, the level stays high until outcome (Pineault, 2007). Social support from friends and family members is not enough to reduce anxiety, instead the support provided by the medical staff is important (Pineault, 2007). Indeed, low anxiety levels reflect the physicians' good communication skills, rather than the support of friends and family members (Miller et al., 2013; Pineault, 2007). In order to decrease anxiety in the pre-biopsy phase, women seem to need support from health care professionals during the first consultation in order to prevent the exacerbation of their preoccupations at the time of the procedure. This aspect should be appreciated in order to improve the communication quality during the biopsy procedure and the recommendations on the procedure itself (Miller et al., 2013).

(b) Anxiety and other psychological variables

Four studies have investigated the way in which several psychological factors could be associated to anxiety levels before the breast biopsy.

Drageset & Lindstrøm (2005) found a high level of state-anxiety in women undergoing breast biopsy, comparable to what experienced by patients awaiting a surgical intervention. Authors have also examined the relationship between the following variables: (a) Demographic data, (b) Social Support,

(c) Instrumental Coping (Mastery Oriented), (d) Defensive Coping (cognitive and hostile type). In particular they have observed that a high level of *Social Support* is related to a greater use of *Instrumental Coping*, which could be effective in dealing with a potential breast cancer diagnosis. However, being good copers could lead to a better social networking. Instead, no relationship has emerged between *Social Support* and *Defensive Coping*. Women using a *Defensive coping* style before biopsy then found more difficult to cope with the breast cancer diagnosis. The authors concluded that anxiety does not result significantly related to socio-demographic variables but could be moderately reduced by the bidirectional relationship between *Social Support* and *Instrumental Coping*.

Harding (2014) explored the incidence of distress, by assessing with standardized self-report instruments the factors that would be associated with higher anxiety levels in the diagnostic phase. Results detected the presence of clinically significant anxiety levels in the diagnostic phase, also showing the presence of relevant depressive symptoms. However, the degree of a possible comorbidity between anxiety and depressions is not clear. Authors suppose that the difference among women in the presence of anxiety and depression levels is given by the possible presence of depressive symptoms before the diagnostic phase or by a difference in the reaction to this experience. Trait-anxiety has a strong impact on the distress level. Even the medical history and the eventuality of previous breast biopsies have an impact on the distress level perceived by patients: women who have previously underwent a breast biopsy showed higher anxiety level. The authors attribute the high anxiety level in this diagnostic phase to risk perception (Harding, 2014).

In a comparative study Novy and colleagues (2001) have assessed pre-biopsy anxiety. On average all the participants had elevated anxiety scores (Novy et al., 2001). Novy et al., (2001) as Harding (2014) found the trait-anxiety level of women are higher than in the general population (Novy et al., 2001).

Another study (Balmadrid et al., 2015) examined the relationship between anxiety and awaiting time from the communication of the necessity of breast biopsy to the date of it, taking in to account the impact of the *Chronic Life Stress* (CLS) variable which provides a self-report rating of chronic life stress factors in various domains, such as general or ambient problems, financial issues, work, marriage, parental concerns, social or health issues. Results showed that the CLS variable has a significant impact: if CLS level is high, anxiety level could be relevant regardless of the awaiting time variable. Instead if variable CLS is low, the wait time will result an explanatory mediator of the increase in anxiety (Balmadrid et al., 2015).

The presented studies identify many psychological factors associated with anxiety in the diagnostic phase: the use of a *Defensive Coping* and a lower perception of *Social Support* decreases efficacy in dealing with a breast cancer diagnosis (Drageset & Lindstrøm, 2005); *Trait-Anxiety* and *Risk Perception* of a breast cancer produce an increase in distress and in pre-biopsy anxiety level (Harding, 2014; Novy et al., 2001); finally, the CLS factor seems to be relevant even in the event of a benign diagnosis. Indeed, in those who present a low level of CLS the awaiting time seems to be important to the extent that as time increases, so does anxiety. However this is only true for patients with a benign diagnosis, for patients with a malignant diagnosis anxiety remains high. The Uncertainty about the Result variable seems also important in raising anxiety (Balmadrid et al., 2015).

(c) Anxiety and biopsy procedure

Two randomized studies (Flory & Lang, 2011) compared the distress level among three patient groups:

a) women with suspected breast cancer who are waiting for breast biopsy;
b) women undergoing the invasive procedure with a potential risk for malignant liver neoplasm;
c) women undergoing the invasive procedure with a potential diagnosis of uterine cancer.

The results showed for all three groups high mean levels of perceived distress and depressed mood, but only women who should undergo breast biopsy (Group a) reported high anxiety levels. In particular, group a reached a Mean STAI score of 48, Group b reached a Mean STAI score of 26, quite close to Group c, which reached a mean STAI score of 24. The same trend can be reported for the *Perceived Stress Scale* (*PSS*): women who should undergo breast biopsy (Group a) reported significantly higher levels of PSS (Mean = 18) when compared to Group b (Mean = 15) and Group c (Mean = 16). The result that women while waiting for biopsy were statistically significant more anxious than women who should undergo a more risky and invasive procedure was unexpected. Moreover, Flory & Lang (2011) suggest that the Invasiveness of the Procedure has less influence on patients' distress than the Uncertainty about the Result.

A correlational study (Miller et al., 2014) investigated

whether the distress before breast biopsy correlates with the quality of experience during biopsy (described in terms of pain and physical perceived discomfort during the procedure), and whether the type of experimented distress (anxiety level, worry about the procedure and the its result) would differ in relation to the quality of the experience during biopsy. Results point out that pre-biopsy worry about the procedure was significantly associated to both pain (r = .38, p<.001) and physical discomfort (r = .31, p<.05); pre-biopsy general anxiety correlated with pain (r = .36, p<.001), but not with physical dis-comfort; and pre-biopsy worry about the biopsy results did not significantly relate to pain or physical discomfort. These studies underline that anxiety is not mainly related to the level of the procedure's invasiveness, but seems to be mostly correlated to the uncertainty about the outcome and to the expectations about the result (Flory & Lang, 2011).

(d) Anxiety and Waiting for results

A study (Ubhi et al.,1996) tried to explore the relationship between *Anxiety* and *Waiting for results* of a breast biopsy. The study contrasted an immediate communication of the results with a waiting time of week at least. Results showed that in the event of a malignant diagnosis anxiety level stays high regardless of awaiting time. In women with benign diagnosis the originally high anxiety level decreased after outcome communication. Therefore, it is important to reduce the waiting time since an immediate diagnosis communication in the event of benign biopsy is beneficial (Ubhi et al., 1996); furthermore, immediate communication is important also in the event of a malignant diagnosis, though anxiety levels do not seem to decrease.

CONCLUSIONS

In the present paper we provide an homogeneous description of all the studies that assessed pre- and post-operative anxiety levels in women undergoing breast biopsy was achieved and the investigated the psychosocial and situational factors and the psychological variables that appear to influence them. Overall, the most relevant among them were found to be Perceived Communication, Perceived Risk of a diagnosis, Invasiveness of the Procedure, Perceived Support from the staff, Trait-Anxiety, Chronic Life Stress (CLS) and inability to take advantage of an Instrumental Coping, which in the oncologic contest seems to be more functional (Drageset & Lindstrøm, 2005).

There is evidence that the quality of the communication with the health care providers is able to influence the experience of undergoing a breast biopsy; however the perceived risk of receiving a cancer diagnosis seems to reduce the benefit of a good communication between the radiologists and the patients.

The staff members are found to provide reliable support to women undergoing breast biopsy; in particular women report to experience less anxiety when they receive emotional and informative support from the staff members than when being supported by non-professional caregivers. However the benefit obtained from support by professionals is less evident in the case of malignant diagnosis. This evidence suggests that more efforts should be made in monitoring the quality of support provided to patients by the staff members in the case of a threatening outcome of the biopsy. The examined literature confirms that *Trait Anxiety* and *Chronic Life Stress* (CLS) are good predictors of situational anxiety for women undergoing breast biopsy; in particular CLS is associated with higher level biopsy anxiety levels even in women with a probable benign outcome. All the socio-demographic predictors that were empirically evaluated failed to reach significance. Two empirical studies evaluated the relationship between Preoperative Anxiety levels and Invasiveness of the Procedure, showing that (1) anxiety is higher in patients undergoing biopsy rather than in patients undergoing more invasive procedures, and (2) the Uncertainty about the Diagnosis variable has a stronger influence on anxiety levels in women undergoing breast biopsy than in women undergoing others type of diagnostic procedures. Infact a second study found that worry is the most reliable predictor of Distress (in terms of anxiety, preoccupation for the procedure and for the result) and the "Physical Discomfort" in women undergoing breast biopsy.

Implications for clinical practice

From our review, the factors that are found to influence in a relevant way anxiety levels related to breast biopsy are different. Some of them are individual factors, such as *Trait Anxiety* and *Chronic Life Stress*, which cannot be effectively manipulated with specific psychological interventions.

Some other variables, such as the worry and uncertainty

about the results, are intrinsically related to the diagnostic phase and cannot be treated with empirical manipulations. On the contrary the other relevant variables can be considered as suitable targets for interventions aiming to reduce anxiety levels. In particular, best practices should include careful efforts to reduce the waiting time for results to the minimum possible level and patients should be made aware of this. Furthermore the staff members should became aware that in this very delicate phase of the diagnostic process, the perceived support from their part is considered by the patients to be more effective than the one perceived from friends and relatives. Professionals should therefore take responsibility for that, and should ask for more suitable psychological tools to provide this type of support.

Finally, the quality of the communication should also be constantly monitored. In particular attention should be provided to different aspects, such as the clarity and the completeness of the provided information, the real comprehension of the communicated information from the part of the patients and the emphatic concern of the emotional state of the patients.

In line with these considerations, tailored psychological interventions could target both pre-operative anxiety levels in the patients and all the organizational and relational competences of the staff members that were shown to critically influence the experience of women undergoing breast biopsy.

Limitations

On the basis of the consideration of the PRISMA criteria, recruitment was adequate in eight trials, while in two studies the allocation of participants to groups was not described.

References

ANDRYKOWSKI, M.A., CARPENTER, J.S., STUDTS, J.L., CORDOVA, M.J., CUNNINGHAM, L.L.C., BEACHAM, A., SLOAN, D. et al., (2002). Psychological impact of benign breast biopsy: A longitudinal, comparative study. *Health psychology*, *21* (5), 485-494.

AUST, H., RÜSCH, D., SCHUSTER, M., STURM, T., BREHM, F. & NESTORIUC, Y. (2016). Coping strategies in anxious surgical patients. *BMC Health Services Research*, *16*, 250.

BALMADRID, M.A.H., SHELBY, R.A., WREN, A.A., MILLER, L.S., YOON, S.C., BAKER, J.A., WILDERMANN, L.A. & SOO, M.S. (2011). Anxiety prior to breast biopsy: Relationships with length of time from breast biopsy recommendation to biopsy procedure and psychosocial factors. *Journal of Health Psychology*, *22* (5), 561-571.

DeSANTIS, C., MA, J., BRYAN, L. & JEMAL, A. (2014). Breast cancer statistics, 2013. CA: *A Cancer Journal for Clinicians*, *64*, 52-62.

DE VRIES, A.M.M., ROTEN, Y.D., MEYSTRE, C., PASSCHIER, J., DESPLAND, J.N., & STIEFEL, F. (2014). Clinician characteristics, communication, and patient outcome in oncology: A systematic review. *Psycho-Oncology*, *23* (4), 375-381.

DRAGESET, S. & LINDSTRØM, T.C. (2005). Coping with a possible breast cancer diagnosis: Demographic factors and social support. *Journal of Advanced Nursing*, *51* (3), 217-226.

FEIG, S.A. (2004). Adverse effects of screening mammography. *Radiologic Clinics of North America*, *42* (5), 807-819.

FEKRAT, F., SAHIN, A., YAZICI, K.M. & AYPAR, U. (2006). Anaesthetists' and surgeons' estimation of preoperative anxiety by patients submitted for elective surgery in a university hospital. *European Journal of Anaesthesiology*, *23* (3), 227-233.

FLORY, N. & LANG, E.V., (2011). Distress in the radiology waiting room. *Radiology*, *260*, 166-173.

HARDING, M.M. (2014). Incidence of distress and associated factors in women undergoing breast diagnostic evaluation. *Western Journal Nursing Research*, *36* (4), 475-494.

HUGHSON, A.V.M., COOPER, A.F., McARDLES, C.S. & SMITH, D.C. (1988). Psychosocial morbidity in patients awaiting breast biopsy. *Journal of psychosomatic research*, *32* (2), 173-180.

HULBERT-WILLIAMS, N., NEAL, R., MORRISON, V., HOOD, K. & WILKINSON, C. (2012). Anxiety, depression and quality of life after cancer diagnosis: what psychosocial variables best predict how patients adjust? *Psycho-Oncology*, *21* (8), 857-867.

HUMPHREY, K.L., LEE, J.M., DONELAN, K., KONG, C.Y., WILLIAMS, O., ITAUMA, O., HALPERN, E.F., GERADE, B.J., RAFFERTY, B.J. & SWAN, J.S. (2014). Percutaneous breast biopsy: Effect on short-term quality of life. *Radiology*, *270*, 362-368.

KHAN, H.M., GITTNER, L.S., PERISETTI, A., SAXENA, A., RAFIQ, A., GABBIDON, K., MENDE, S. & LYUKSYUTOVA, M. (2017). Does Survival Vary for Breast Cancer Patients in the United States? A Study from Six Randomly Selected States. *Journal of Environmental and Public Health*, *2017*.

KHAN, H., SAXENA, A., PERISETTI, A., RAFIQ, A., GABBIDON, K., MENDE, S., LYUKSYUTOVA, M., QUESADA, K., BLAKELY, S., TIFFANY TORRES, T. & AFESSE, M. (2016). Does breast cancer drive the building of survival probability models among states? An assessment of goodness of fit for patient data from SEER Registries. *Asian Pacific Journal of Cancer Prevention*, *17* (12), 6187-6194.

LAUBY-SECRETAN, B., SCOCCIANTI, C., LOOMIS, D., BENBRAHIM-TALLAA, L., BOUVARD, V., BIANCHINI, F. & STRAIF, K. (2015). Breast-Cancer Screening - Viewpoint of the IARC Working Group. *The New England Journal of Medicine*, *372* (24), 2353-2358.

LEBEL, S., JAKUBOVITSC, G., ROSBERGERA, Z., LOISELLEA, C., SEGUINA, C., CORNAZA, C., INGRAMA, J., AUGUSTA, L. & LISBONA, A. (2003). Waiting for a breast biopsy Psychosocial consequences and coping strategies. *Journal of Psychosomatic Research*, *55*, 437-443.

LIAO, M.N.M., CHEN, P.L., CHEN, M.F. & CHEN, S.C., (2010). Effect of supportive care on the anxiety of women with suspected breast cancer. *Journal of Advanced Nursing*, *66* (1), 49-59.

MASOOD, Z., HAIDER, J., MASOOD, J. & ALAM S.N. (2009). Preoperative anxiety in female patients: The issue needs to be addresses. *KUST Medical Journal*, *1* (2), 38-41.

MILLER, S.J., SCHNUR, J.B., MARGOLIES, L., BOLNO, J., SZABO, J., HERMANN, G., MONTGOMERY, G.H. & SOHL, S.J. (2014). Pre-biopsy psychological factors predict patient biopsy experience. *International Journal of Behavioral Medicine*, *21* (1), 144-148.

MILLER, L.S., SHELBY, R.A., BALMADRID, M.H., YOON, S., BAKER, J.A., WILDERMANN, L. & SOO, M.S. (2013). Patient anxiety before and immediately after imaging guided breast biopsy procedures: Impact of radiologist-patient communication. *Journal American College Radiology*, *10* (6), 423-431.

MOHER, D., SHAMSEER, L., CLARKE, M., GHERSI, D., LIBERATI, A., PETTICREW, M., SHEKELLE, P. & STEWART, L.A. (2015). Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4* (1).

MOON, J. (2008). *Critical Thinking*. London: Routledge.

NORTHOUSE, L.L. (1989). The impact of breast cancer on patients and husbands. *Cancer nursing*, 12 (5), 278-284.

NOVY, D.M., PRICE, M., HUYNH, P.T. & SCHUETZ, A., (2001). Percutaneos core biopsy of the breast: Correlates of anxiety. *Academic Radiology*, *8*, 467-472.

PINEAULT, P. (2007). Breast cancer screening: Women's experiences of waiting for further testing. *Oncology Nursing Forum*, *34* (4), 847-853.

POOLE, K. (1997). The emergence of the 'waiting game': A critical examination of the psychosocial issue in diagnosing breast cancer. *Journal of Advanced Nursing*, *25*, 273-281.

PRITCHARD, M.J. (2009). Managing anxiety in the elective surgical patient. *British Journal of Nursing*, *18* (7), 1416-1419.

SHAMSEER, L., MOHER, D., CLARKE, M., GHERSI, D., LIBERATI, A., PETTICREW, M., SHEKELLE, P., STEWART, L.A. & PRISMA-P Group (2015). Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015: Elaboration and explanation. *BMJ*, 349, g7647.

SOO, A.E., SHELBY, R.A., MILLER, L.S., BALMADRID, M.H., JOHNSON, K.S., WREN, A.A., YOON, S.C., KEEFE, F.J. & SOO, M.S. (2014). Predictors of pain experienced by women during percutaneous imaging-guided breast biopsies. *Journal of the American College of Radiology*, *11* (7), 709-714.

UBHI, S.S., WRIGHT, S., CLARKE, L., BLACK, S., SHAW, P., STOTTER, A. & WINDLE, R., (1996). Anxiety in patients with symptomatic breast disease: Effects of immediate versus delayed communication of results. *Annals of The Royal College of Surgeons of England*, *78*, 466-469.

VAINIO, H. & BIANCHINI, F. (2002). *IARC handbooks of cancer prevention: Breast cancer screening*. Lyon: IARC.

ZORZELA, L., LOKE, Y.K, IOANNIDIS, J.P., GOLDER, S., SANTAGUIDA, P., ALTMAN, D.G. et al. (2016). PRISMA harms checklist: Improving harms reporting in systematic reviews. *BMJ*, 352, i157.