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Males' Awareness of Benign Testicular Disorders (BTD): An Integrative Review

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Abstract

Disorders that affect the testes can range from painless and benign to debilitating and life-threatening. Despite the availability of literature on the etiology, diagnosis, and treatment of benign testicular disorders (BTD), very little is known about men's awareness of these conditions.

The aim of this review was to extract and analyze evidence from studies that explored males' awareness of BTD.

Four e-databases (CINAHL, MEDLINE, PsychINFO, and PubMed) were thoroughly searched and four articles met the review inclusion criteria. The quality of the included studies was appraised and data were extracted and cross-checked using a standardized data extraction table.

It was determined that participants lacked education about testicular self-examination and scrotal signs and symptoms which contributed to their lack of awareness of BTD. Help-seeking in the event of scrotal abnormalities was suboptimal which is alarming given the acuteness of some BTD such as testicular torsion. Individuals who are at risk for health disparities were underrepresented in the reviewed literature.

Findings from this review highlight the need to address barriers to BTD knowledge and help-seeking. This could be achieved through making use of past interventions that succeeded in increasing men's awareness of testicular cancer such as university campaigns and mass media. From a practical standpoint, clinicians must be encouraged to educate young men about BTD. This could be attained through tailoring creative educational interventions that are sensitive to the needs of individuals who are at risk for health disparities.

Keywords: Benign testicular disorders, awareness, knowledge, help-seeking, males.

Males' Awareness of Benign Testicular Disorders (BTD): An Integrative Review

Background and Aim

Overview

Disorders that affect the testes are numerous and can range from painless and benign to debilitating and malignant (Table 1) (Wampler, 2010). Testicular torsion, infection, trauma, and tumor are frequently discussed in the literature on testicular disorders. Testicular cancer predominantly affects men aged 18 to 35 years. It constitutes 0.5% of all cancer cases and accounts for 0.1% of all cancer mortalities in the United States (National Cancer Institute, 2014). Testicular torsion, Epididymo-orchitis, and trauma are benign conditions that constitute the acute scrotum, a medical emergency characterized by a sudden onset of scrotal pain, swelling, and redness (D'Andrea et al., 2013). Serious complications such as ischemia, necrosis, and sepsis can occur in testicular torsion (Gordhan & Sadeghi-Nejad, 2015). Epididymo-orchitis, a sexually transmitted infection, can cause a number of symptoms and can affect men's relationships with their partners (Trojian, Lishnak, & Heiman, 2009; Centers for Disease Control and Prevention, 2015). Non-acute BTD can also impact the male's life. Varicocele, for instance, is known to be the prime cause of infertility among males attending fertility clinics (Khera & Lipshultz, 2008; Mohammed & Chinegwundoh, 2009).

Review Significance and Aim

In the past two decades, numerous research efforts have been made to explore and improve males' awareness of testicular cancer and its screening. In addition, two systematic reviews have been conducted to pool and analyze findings from these studies in order to inform research, practice, and education (Rovito, Cavayero, & Harlin, 2015; Saab, Landers, & Hegarty, 2016). This is not the case when it comes to BTD. While a number of papers tackled the diagnosis, clinical presentation, and management of BTD (Khera & Lipshultz, 2008;

Osifo & Osaigbovo, 2008; Tracy, Steers, & Costabile, 2008; Mohammed & Chinegwundoh, 2009; Trojian et al., 2009; Wampler, 2010; Lopez & Beasley, 2012; D'Andrea et al., 2013; Srinath, 2013; Gordhan & Sadeghi-Nejad, 2015), very few studies explored males' awareness of these conditions, no identified studies have been conducted to enhance males' knowledge of benign diseases of the testes, and, to the authors' knowledge, no reviews have been conducted to critically analyze evidence from studies on BTD. The aim of this review was to extract and analyze evidence from studies that explored males' awareness of BTD. The specific review questions are as follows: What are the males' (1) knowledge, awareness, and attitudes with regard to BTD and their screening, and (2) their help-seeking behaviors in the event of abnormal scrotal findings?

Methods

Integrative reviews enable researchers to summarize evidence, understand a particular clinical problem, identify gaps in the literature, appraise the strength of evidence, and determine the need for future research (Russell, 2005). Theoretical literature, research literature, or both are often included in integrative reviews. The broad nature of this review methodology might hinder rigor and increase the risk for bias (Whittemore & Knafl, 2005). To enhance rigor and reduce bias, the method proposed by Whittemore (2005) and Whittemore and Knafl (2005) was used to guide the write-up of this review. First, the problem was identified and the significance of the review was highlighted. The literature was searched systematically according to specific eligibility criteria. Data from the included studies were then extracted and presented using a standardized extraction table (Goossens et al., 2014; Saab et al., 2016). There is no gold standard for appraising the quality of studies included in a review. Moreover, the choice of quality appraisal tools depends on the study design (Whittemore & Knafl, 2005). On this basis, the quality of the studies included in this review was appraised using a tool that evaluated the quality of cross-sectional studies in

previous reviews (Louw, Morris, & Grimmer-Somers, 2007; Wong, Cheung, & Hart, 2008; Roman & Frantz, 2013; Davids & Roman, 2014; Saab et al., 2016). Finally, findings from the included studies were discussed in line with relevant literature and recommendations for research, practice, and education were made accordingly.

Eligibility Criteria

Data were sought from records published between the year 1985 and 2015 in peer-reviewed academic journals. Quantitative and qualitative studies that assessed and/or explored men's knowledge of BTD as well as experimental studies that aimed at increasing men's awareness of these disorders were sought. Systematic reviews, integrative reviews, meta-analyses, and meta-syntheses that addressed BTD awareness were also considered in the literature search. As the quality of non-English papers could not be assessed, the search was limited to studies published in or translated to English. Given the paucity of the literature on BTD, no limits other than language were applied during the literature search.

Studies that offered an overview of BTD, addressed testicular cancer awareness, and included men with pre-existing testicular disorders were excluded based on the assumption that a prior diagnosis of one or more testicular conditions would affect knowledge scores. Assuming that women's awareness of BTD and their educational needs might differ from those of men, papers that presented findings from females were also excluded. Screening, diagnosis, and treatment guidelines as well as epidemiological studies and expert opinions were also omitted.

Information Sources and Search Strategy

Four e-databases (CINAHL, MEDLINE, PsychINFO, and PubMed) were systematically searched in July 2015 to identify studies that are in line with the review aim and questions. Keywords were combined using Boolean terms, medical subject headings, and truncation.

Subheadings were also used to yield a wider search and the following search history was generated: (non-maligan* OR benign OR mass OR lump OR pain OR hydrocele OR varicocele OR torsion OR epididymitis OR orchitis OR swelling OR inflamm*) AND (testicul* OR testes OR testis OR testicle* OR scrot*) AND (self-exam* OR 'self exam*' OR screening OR 'early detection' OR awareness OR knowledge OR attitude OR practice OR 'health promotion' OR symptoms). In addition, the reference lists of potentially eligible studies were checked to find papers that could not be identified during e-database search.

Screening and Extraction Process

All the records were exported to and pooled in a software for research and reference management, duplicates were then deleted. The title and abstract of the remaining records were screened separately by two reviewers and the full-text of potentially relevant articles was read. Irrelevant articles were then excluded based on title and abstract. The reviewers' level of agreement was calculated using Cohen's kappa coefficient. A score of 0.89 was obtained and was interpreted as satisfactory (Higgins & Green, 2011).

A standardized table was used to extract data from the included studies (Goossens et al., 2014; Saab et al., 2016) and was later cross-checked for accuracy by another reviewer. Data extracted included the source citation, the study aim, and the country and setting where data were collected. The study population, design, and instruments were also presented. Findings that support the review questions were then extracted and the quality of the included studies was appraised.

Quality Appraisal

Quality appraisal of studies included in integrative reviews is thought to enhance rigor and reduce the risk for bias (Whittemore & Knafl, 2005). A tool that was developed to appraise the quality of cross-sectional studies in previous reviews was deemed appropriate to evaluate

the quality of the studies included in this review (Louw et al., 2007; Wong et al., 2008; Roman & Frantz, 2013; Davids & Roman, 2014; Saab et al., 2016).

The methodological quality of the included studies was appraised based on the representativeness of the sample, response rate, reliability and validity of the tools used to collect data, and whether a primary data source was used for data collection. The tool was then modified to match the findings from the reviewed studies with the review questions. A score was then calculated and the quality of the studies was ranked as either weak (0-33.9%), moderate (34-66.9%), or strong (67-100%).

Results

Database search yielded 4506 records (Figure 1). A large number of duplicates were deleted (n=2831) since PubMed is an interface of MEDLINE (Motschall & Flack-Ytter, 2005). A total of 1675 records were screened on title and abstract. Irrelevant articles were then excluded. Potentially relevant records (n=55) were read thoroughly. Only four articles were deemed eligible for inclusion. The remaining records (n=51) did not meet the review eligibility criteria either because they offered an overview of BTD (n=15), presented findings from studies on testicular cancer (n=6), or included findings from men with pre-existing testicular disorders (n=6). Screening guidelines (n=5), diagnostic tests (n=4), treatment modalities (n=4), epidemiological studies (n=3), expert opinions (n=3), and studies that presented findings from both males and females (n=2) were also excluded. In addition, excluded records comprised one book review, one review about health promotion, and an overview of testicular pain. No intervention studies, qualitative studies, systematic reviews, meta-analyses, or meta-syntheses were identified during literature search and none of the studies identified through reference list checks met the review inclusion criteria.

Characteristics of the Reviewed Studies

Studies reviewed were conducted between the year 2000 and 2011 (Table 2). All but one (Babu, Hazra, Chhotray, & Satyanarayana, 2004) were conducted in the United States. Data were sought from schools (Nasrallah, Nair, Congeni, Bennett, & McMahon, 2000; Congeni, Miller, & Bennett, 2005), a community setting (Babu et al., 2004), and a university (Clark, JaNeille, & Gerry, 2011). All the studies were descriptive cross-sectional using researcher-designed questionnaires. Only one study reported having a qualitative element (Babu et al., 2004), data from this study, however, were collected using a researcher-administered questionnaire and findings were presented and discussed quantitatively. The sample size ranged between 318 (Nasrallah et al., 2000) and 755 (Congeni et al., 2005) and participants' ages ranged between 12 years (Nasrallah et al., 2000) and above 51 years (Babu et al., 2004). Two of the reviewed studies addressed general awareness of testicular disorders (Nasrallah et al., 2000; Congeni et al., 2005), one addressed hydrocele awareness in an endemic area (Babu et al., 2004), and the fourth study explored young men's awareness of testicular torsion (Clark et al., 2011). In terms of quality appraisal (Table 3), scores ranged between 43 and 57%. No studies scored high on the quality appraisal tool. Sample representativeness was addressed in one study (Babu et al., 2004) and response rate was reported in another study (Clark et al., 2011). All data collection instruments were researcher-designed with no data on how the instruments were developed and whether they were pre-tested or pilot-tested. The number of items per data collection instrument ranged between two (Clark et al., 2011) and five (Nasrallah et al., 2000; Congeni et al., 2005). Of the tools used to collect data, only one reported on reliability (Babu et al., 2004) and none reported on validity which makes it difficult to ascertain the consistency, dependability, and accuracy of findings (Sullivan, 2011).

Key Findings

Awareness of BTD. All the participants in the study by Nasrallah et al. (2000) and Congeni et al. (2005) were exposed to genital examination as part of sports-related checkup, yet only 54% (n=172) and 50% (n=380) understood the reason behind genital examination respectively. With regard to hydrocele, 69.9% (n=262) of men living in an endemic area in India were aware of the seriousness of hydrocele in their community, yet only 45.5% (n=171) knew that this disease can be transmitted via mosquito bite (Babu et al., 2004). Awareness was lowest among individuals belonging to "scheduled tribes, scheduled castes and backward castes" (p. 123) as well as men with primary education or no education. As for testicular torsion, only 18% (n=48) of college students heard of this complication and 43% (n=116) were instructed about the seriousness of scrotal pain (Clark et al., 2011).

Help seeking behaviors. Three of the reviewed studies addressed help seeking in the event of scrotal abnormalities (Nasrallah et al., 2000; Congeni et al., 2005; Clark et al., 2011). Only 15% (n=49) of participants in the study by Nasrallah et al. (2000) and 15% (n=112) of participants in the study by Congeni et al. (2005) would seek help in the event of testicular swelling. However, when asked about help-seeking in the event of testicular swelling together with pain, 64% (n=204) and 66% (n=495) stated that they would seek medical attention respectively. In contrast, less than half of the college students (48%, n=110) in the study by Clark et al. (2011) chose to seek emergency care in the event of testicular pain and 39% (n=102) chose to delay help seeking for a day or two.

Discussion

Contrary to the literature on testicular cancer awareness, very little is known about males' knowledge of BTD. Only hydrocele and testicular torsion were addressed in the reviewed literature which leaves us with no data regarding males' awareness of other common testicular diseases such as epididymitis and varicocele.

Lack of awareness with regard to BTD (Nasrallah et al., 2000; Babu et al., 2004; Congeni et al., 2005; Clark et al., 2011) and delay in help-seeking in the event of testicular swelling and/or pain (Nasrallah et al., 2000; Congeni et al., 2005; Clark et al., 2011) were the overarching findings across the reviewed studies. Furthermore, very few participants were instructed about testicular self-examination and scrotal signs and symptoms which could have contributed to their lack of awareness with regard to BTD. These findings are echoed in the literature on testicular cancer awareness whereby participants' low knowledge scores were attributed to lack of education about this malignancy (Saab et al., 2016). Findings from the study by Babu et al. (2004) regarding lack of awareness of hydrocele reflect the overall knowledge deficit with regard to malignant testicular disorders in the developing world (Sirin, Atan, & Tasci, 2006; Ugboma & Aburoma, 2011; Urgurlu et al., 2011; Özbaş, Çavdar, Findik, & Akyüz, 2012; Kuzgunbay et al., 2013; J. K. Muliira, Nalwanga, R. S. Muliira, & Nankinga, 2013; Onyiriuka & Imoebe, 2013).

Low knowledge of BTD was attributed to a number of factors namely the lack of public awareness with regard to health screening, the lack of health education in schools and colleges, and the lack of endorsement of health screening and disease prevention by legislators in the developing world (Ugboma & Aburoma, 2011; Kuzgunbay et al., 2013; Muliira et al., 2013).

As for help-seeking, there is very little evidence with regard to this behavior in the event of abnormal scrotal findings. It was reported that help-seeking is best in the event of testicular swelling together with pain and worst in the event of swelling alone (Congeni et al., 2005). This finding is alarming since, as previously discussed, the longer one delays seeking medical attention in the event of scrotal pain, the lower the chances to salvage the affected testicle. This is particularly important in cases such as testicular torsion (Ringdahl & Teague, 2006; Gordhan & Sadeghi-Nejad, 2015). Barriers and facilitators to help-seeking were not explored

in the reviewed studies and no correlations were made between participants' awareness of BTD and help-seeking. Drawing from studies on testicular cancer, however, one can assume that the more males are aware of BTD, the more likely they would seek medical attention in the event of abnormal scrotal findings (Casey, Grainger, & Butler, 2011). In the literature on testicular cancer, delay in seeking medical attention was attributed to fear from testicular cancer as well as lack of knowledge with regard to its screening (Cronholm, Mao, Nguyen, & Paris, 2009; Saab et al., 2016). Testicular cancer patients in Australia who delayed help-seeking lacked knowledge about this disorder, misinterpreted their symptoms, had slowly progressing or mild symptoms, were embarrassed from genital examination, were too busy to seek help, and feared orchiectomy (Carbone, Walker, Burney, & Newton, 2009). Similarly, lack of prior knowledge of testicular cancer, its risk factors, and its screening contributed to delay in help-seeking among long-term survivors of testicular cancer in Lebanon (Saab, Noureddine, Huijer, & DeJong, 2014).

Despite the apparent lack of awareness regarding BTD and delay in seeking help in the event of abnormal scrotal findings, the literature lacks intervention studies to close the knowledge gap and enhance help-seeking. In addition, none of the reviewed studies addressed barriers to knowledge and help-seeking and none highlighted men's informational needs and preferred modes of information delivery which was also reported as one of the major gaps in the literature on testicular cancer (Rovito et al., 2015; Saab et al., 2016). It is worth noting that minority groups as well as individuals who are at risk for health disparities were underrepresented in the literature on BTD which hinders the generalizability of findings and their applicability to different contexts. This gap was also identified in the literature on testicular cancer awareness (Saab et al., 2016).

Implications

Implications for future research. The knowledge regarding BTD is suboptimal which is alarming since a number of testicular disorders can be life-threatening and can have tremendous effects on the man's life. Given the paucity of research on this topic, closing the knowledge gap with regard to BTD awareness and help-seeking is key. Minority groups were underrepresented in the literature on BTD which impedes the generalizability of findings and hinders their applicability to males who are at risk for health inequities. This highlights the need to address BTD awareness among these groups. In addition, all but one study included high school and university students who are relatively educated which informs the need to explore BTD awareness among males with a low educational background.

From a methodological perspective, researchers must be encouraged to use reliable and valid data collection instruments in future studies on BTD. This is thought to yield consistent, accurate, and generalizable findings. Researchers must also be encouraged to use standardized methods to plan, develop, and test these instruments prior to collecting data. The use of random sampling must be emphasized to enhance the sample representativeness.

The absence of intervention studies in the literature on non-malignant testicular conditions highlights the need to plan, design, and implement educational and health-promoting interventions in this regard. First, research efforts should be made to explore BTD knowledge and understand barriers to help-seeking. Second, men's educational needs as well as their preferred learning strategies should be explored. This could be achieved using face-to-face interviews and/or focus groups. Findings from these interviews as well as frameworks for intervention development would help develop, evaluate, and implement complex interventions to raise awareness of BTD and encourage early help-seeking (Craig, Dieppe, Macintyre, Michie, Nazareth, & Petticrew, 2008). The use of behavioural change theories and intervention-based models to underpin such interventions is key (Savage, Farrel, McManus, & Grey, 2010). Examples include the Health Belief Model (Rosenstock, 1966), the Theory of

Reasoned Action (Fishbein & Ajzen, 1975), and the Theory of Planned Behaviour (Ajzen, 1985). Alternatively, researchers can make use of past interventions that succeeded in increasing men's awareness of testicular cancer. Examples include university campaigns (Wanzer, Foster, Servoss, & LaBelle, 2014), mass-mediated information delivery (Trumbo, 2004), and educational material printed on shower gel sachets and waterproof stickers (McCullagh, Lewis, & Warlow, 2005).

Implications for practice and education. Findings from the studies reviewed suggest that many of the participants who underwent sports-related physical examination were not informed as to the purpose of scrotal examination (Nasrallah et al., 2000; Congeni et al., 2005). This informs the need to prompt clinicians to educate young adults about the usefulness of genital examination in the early detection of both benign and malignant testicular disorders. Clinicians must also be encouraged to instruct young men about the signs and symptoms of the acute scrotum in order to seek timely medical attention. Moreover, as young men are counseled to practice testicular self-examination for the early detection of testicular cancer, findings from this review suggest that males ought to be counseled to practice self-examination in order to familiarize themselves with what is normal for them. This can be achieved through the use of a number of creative educational strategies that are tailored to the needs of the younger generation. For instance, clinician-provided websites were identified as the best means to offer quality information about hydrocele, therefore access to such website must be encouraged (Nason, Tareen, & Quinn, 2013). Other examples of means to raise awareness of BTD include posters, campaigns, videos, and mass and social media.

Limitations

Methodological limitations. A number of methodological limitations were identified during the review process. First, all the reviewed studies were descriptive, therefore they don't fall high (Level 4.a) on The Joanna Briggs Institute (2014) levels of evidence. Second, no intervention studies were identified during literature search which leaves the BTD knowledge gap unaddressed. Third, only one study reported having a qualitative element (Babu et al., 2004), data from this study, however, were collected using a questionnaire and findings were reported quantitatively. No other qualitative studies were conducted to explore males' awareness of BTD and understand the reasons behind the delay in help-seeking. Third, data was collected using researcher-designed questionnaires. Only one study reported on the reliability of the questionnaire (Babu et al., 2004) and none addressed the validity of the instrument used to collect data which hinders the consistency, dependability, and accuracy of findings. Fourth, non-probability purposive sampling was used to recruit participants in all the reviewed studies; this could have led to selection bias consequently affecting the sample representativeness (Cochrane Bias Methods Group, 2013). Finally, only one study included a sample with a relatively low socioeconomic background (Babu et al. 2004). Other health inequities were not represented in the reviewed studies which adversely influences the generalizability of findings and applicability of recommendations.

Critical appraisal of the review process. Rigour was sought throughout the review process by using the method proposed by Whittemore (2005) and Whittemore and Knafl (2005) and assessing the methodological quality of the included studies. Moreover, to our knowledge, this is the first integrative review where findings from studies on BTD awareness were collated and critically discussed. Some limitation, however, are worthy of discussion. The lack of evidence regarding awareness of BTD did not warrant the execution of a systematic review therefore a broader review method was selected. Study selection bias could have taken place due to a number of factors. First, only studies that serve the aim of this

review were selected therefore discounting other studies that could have offered a different insight with regard to BTD. Second, literature search was limited to four databases and did not include studies from the grey literature which could have led to omission of potentially important records. Third, reporting bias could have taken place since only findings that answer the review questions were extracted and discussed. For example, in the study by Babu et al. (2004), findings regarding women's awareness of hydrocele were not presented or discussed since only data from men were sought. Lastly, during the extraction process the primary reviewer had to calculate some statistics that were not explicit in the reviewed papers which could have led to statistical errors. These error were minimized by having a second reviewer independently cross-check the extraction table.

Conclusions

In this review, findings from studies that explored males' awareness of BTD were extracted and analyzed. It was identified that, contrary to the literature on testicular cancer, very little is known about awareness of BTD and no research efforts have been made to close the knowledge gap. Furthermore, as there is evidence that men's awareness of testicular cancer is increasing over the years (Evans, Steptoe, & Wardle, 2006; Saab et al., 2016), their knowledge of BTD remains suboptimal. From a help-seeking perspective, very few males would seek immediate medical attention in the event of testicular pain and fewer would seek it if they noticed testicular swelling. Finally, minority groups as well as individuals who are at risk for or suffer from health inequities were underrepresented in the literature on BTD.

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Table 1. *Characteristics of Various Testicular Disorders*

	Testicular Cancer	**Testicular Torsion**	**Epididymitis/ Orchitis**	**Cryptorchidism**	**Varicocele**	**Hydrocele**	**Spermatocele**
Age of Onset	18-35 years	< 25 years	18-50 years	Neonates	Adolescents and young adults	Neonates and rarely adults	Adults
Etiology	Unknown	- Testicular cancer - Trauma - Cryptorchidism - Horizontal lie of testes - Large testicular volume	- Sexually transmitted infections - Bladder outlet obstruction - Tuberculosis - Mumps	- Maternal factors - Low birth weight - Early birth - Breech position - Positive family history	Unknown	Unknown	Unknown
Signs & Symptoms	- Testicular mass - Pain - Gynecomastia	- Pain (sudden) - Oedema - Nausea/vomiting - Hard and tender nodule	- Pain (insidious) - Swelling - Inflammation	Asymptomatic	- Asymptomatic - Dull and aching sensation (rare)	- Asymptomatic - Pain (if large)	- Asymptomatic - Pain (if large)
Diagnosis	Mass upon palpation and on unltrasound, elevated tumour markers	- Absent cremasteric reflex - Decreased circulation on Doppler and scintigraphy	- Elevated white blood cells - Positive urinalysis and culture	- Empty scrotum - Ultrasound and MRI to locate non-palpable testes	- Palpation of a ‘bag of worms’ - Blood pooling on colour Doppler	- Smooth scrotal mass that transluminates - Ultrasound to confirm diagnosis	- Smooth scrotal mass that transluminates - Ultrasound to confirm diagnosis
Treatment	Orchiectomy and at times chemotherapy and/or radiation therapy	- Surgery - Manual detorsion (undesirable)	- Antibiotics for bacterial infections - Symptomatic treatment	- Observation in infancy - Surgery pre-puberty	- Observation - Surgery if painful or affecting fertility	- Observation - Surgical resection if painful	- Observation - Surgical resection if painful
Complications	Metastasis	- Ischemia - Necrosis - Sepsis	- Sepsis - Infertility	- Infertility - Testicular cancer risk	Infertility	Pain radiating to the back (if large)	Pain radiating to the back (if large)

(Khera & Lipshultz, 2008; Osifo & Osaigbovo, 2008; Tracy, Steers, & Costabile, 2008; Mohammed & Chinegwundoh, 2009; Trojian et al., 2009; Wampler, 2010; Lopez & Beasley, 2012; D'Andrea et al., 2013; Srinath, 2013; Gordhan & Sadeghi-Nejad, 2015)

Table 2. *Characteristics of the Reviewed Studies*

Author(s) & year	Aim(s)	Country & Setting	Study Population [a]	Design	Instruments	Findings [b]	
						Q1	Q2
Nasrallah et al. (2000)*	'Identify the level of knowledge about testicular health in adolescent male athletes.'(p.1115)	- USA - Schools	- n=318 - [NR,12-18y]	Descriptive cross-sectional survey	Researchers designed a (5-item) questionnaire	54% (n=172) understood why genital examination was part of sports physical examination 55% (n=174) correctly identified gear used to protect testes during sports 36% (n=115) knew the at risk categories for testicular cancer	15% (n=49) would seek help in the event of testicular swelling within the correct timeframe 64% (n=204) would seek help in the event of testicular swelling and pain within the correct timeframe
Babu et al. (2004)	'Report the knowledge and beliefs about filarial elephantiasis and hydrocele of people from an endemic area.' (p.121)	- India - Community	- n=749 males (n=375) - [NR, 17->51y]	Descriptive cross-sectional survey (n=375) and face-to-face interviews (n=36)	Researcher administered questionnaire	*Of 375 men:* 45.5% (n=171) stated that mosquitoes can spread hydrocele 69.9% (n=262) stated that hydrocele was a problem in their community *Of 257 men:* 87% (n=221) stated that a lot of people suffer from hydrocele 35% (n=89) believed that people with hydrocele cannot work Participants aged 31-50y; belonging to "scheduled tribes, scheduled castes, and backward castes" (p.123); with primary school	NR

						education and no schooling were found to be least aware of hydrocele ($p<0.05$)	
Congeni et al. (2005)*	'Assess young male athletes' understanding of the need for a genital examination during the sports physical, the signs and symptoms of serious testicular pathology, and the type of genital protection worn for specific sports.' (p.22)	- USA - Schools	- n=755 - [NR, 12-25y]	Descriptive cross-sectional survey	Researchers designed a (5-item) questionnaire	50% (n=380) understood why genital examination was part of sports physical examination 53% (n=397) correctly identified gear used to protect testes during sports 38% (n=285) knew the at risk categories for testicular cancer	15% (n=112) would seek help in the event of testicular swelling within the correct timeframe 66% (n=495) would seek help in the event of testicular swelling and pain within the correct timeframe
Clark et al. (2011)	'Examine an illustrative case and investigate the knowledge of freshman males regarding testicular torsion.' (p.35)	- USA - University	- n=267 - [NR, NR]	Descriptive cross-sectional survey	Researchers designed a (2-item) questionnaire	43% (n=116) were taught about the seriousness of testicular pain 18% (n=48) heard of testicular torsion 58% (n=157) were taught how to perform testicular self-examination	48% (n=110) chose to go to the emergency room in the event of testicular pain 39% (n=102) chose to delay seeking help for a day or two

[a] Sample size (n); [mean age in years (y)±standard deviation, age range in years(y)]; gender: males unless otherwise reported.
[b] What are the males': (Q1) knowledge, awareness, and attitudes with regard to BTD and their screening?; (Q2) help-seeking behaviors in the event of abnormal scrotal findings?

***** The sample in the study by Congeni et al. (2005) includes all the participants in the study by Nasrallah et al. (2000). The same tool was used for data collection in both studies.
Abbreviations: NR, not reported.

Table 3. *Quality Assessment of the Reviewed Studies*

References	**Quality assessment items**					**Relevance to current review**			
	Was the sample likely to be representative of the study population?	**Was a response rate mentioned within the study?**	**Was the instrument used reliable?**	**Was the instrument used valid?**	**Was it a primary data source?**	**Were knowledge, awareness, and attitudes towards BTD and their screening assessed?**	**Were help-seeking behaviours in the event of abnormal testicular findings addressed?**	**Score [a]**	**Quality Ranking [b]**
Nasrallah et al. (2000)	0	0	0	0	1	1	1	43%	Moderate
Babu et al. (2004)	1	0	1	0	1	1	0	57%	Moderate
Congeni et al. (2005)	0	0	0	0	1	1	1	43%	Moderate
Clark et al. (2011)	0	1	0	0	1	1	1	57%	Moderate

[a] Score: total score divided by the total number of items multiplied by 100.

[b] Quality appraisal score matched with the review questions: Weak, 0-33.9%; Moderate, 34-66.9%; Strong, 67-100%

Abbreviations: 0, no/not reported; 1, yes; BTD, benign testicular disorders.