Title: Vegetarian Weaning: A Content Analysis of the Accuracy and Quality of Advice

Available on the Internet.

Student Number: St20065894
I declare that the whole of this work is the result of my individual effort and that all quotations from other authors have been acknowledged.

Dissertation submitted in partial fulfilment of the requirements of Cardiff Metropolitan University for the Degree of Bachelor of Science with Honours.

Date: May 10th 2018.
Abstract:

**Background:** There is widespread use of the Internet for information regarding nutrition and health. This study evaluates the quality and accuracy of online information in English, relating to weaning an infant on a Lacto-Ovo vegetarian diet.

**Methods:** A content analysis of 20 eligible websites was undertaken. The sampling method reflected proven online information seeking habits. Two comprehensive research tools were devised, based on current nutritional guidelines and recommendations to evaluate accuracy and quality of the information provided. Results were analysed to compare information accuracy and quality between health care professional and non-health care professional sources, by origin and by website type – Healthcare, Health Journals, Parenting and Vegetarian.

**Results:** The combined overall score for accuracy and quality was health care professionals 70%, non-health care professionals 51%. The separate scores were health care professionals, 80% accuracy, 62% quality; Non-health care professionals 52% accuracy and 50% quality. Information provided by Health Care professionals overall did not meet the appropriate recommendations for website reading ease scores 70+.

**Conclusions:** Whilst Health care professionals provided information of higher accuracy and quality, the information was written at an inappropriate level for widespread understanding and therefore of less use to its intended audience. There is potential across the majority of websites for an increase in the accuracy and quality of information in relation to Lacto-Ovo vegetarian weaning, to reflect more of the recommendations and advice provided by the recognised authoritative bodies including DoH (1988), WHO (2004 & 2005), NICE (2014), BDA (2016) & SACN (2017).
**Keywords:** Website Analysis, Complementary Feeding, Weaning, Lacto-Ovo Vegetarian, Infant, Online health information.
**Introduction**

It is widely recognised that a healthy diet and lifestyle can enhance quality of all stages of the lifecycle with benefits including “*Significant increases in life expectancy*” (NHS, 2017) and reduced risk of cancer and cardiovascular disease (Heidemann *et al.*, 2008). Healthy diets have an impact on life before birth, with nutritional guidelines established for preconception and pregnancy periods by the National Institute for Health Care Excellence (NICE, 2012 & Hanson *et al.*, 2015). Guidelines also exist in respect of the 0–18 month period (WHO, 1996; 2004 & 2009; NHS, 2015 & 2017) as infants have enhanced nutritional requirements relative to body weight (Genova & Guyda, 2007) and are at greater risk of malnutrition. A healthy diet, is one consisting of a variety of foods from all food groups, in the right proportions, to enable individuals to “*maintain healthy body weight*” (NHS, 2016). Recommendations for a healthy diet have been set out by the World Health Organisation WHO (WHO, 2003 & Hanson *et al.*, 2015).

Some individuals choose to follow vegetarian diets, perceiving it may enhance their health (Patience, 2013). They may also advocate these practises in decisions relating to their children, particularly during the critical growth and developmental periods of infancy and childhood (Genova & Guyda, 2007 & Ferrara *et al.*, 2017). Vegetarianism is defined as the practise refraining from eating “*foods that consist of, or have been produced with the aid of products consisting of, or created from, any part of the body of a living or dead animal*” (Vegetarian Society, 2017). Vegetarianism increasing in popularity (Thane & Bates, 2000 &
Clarys et al., 2014), studies also show individuals following vegetarian diets for reasons other than religion, are more health conscious (Clarys et al., 2014).

Vegetarians have a plant-based diet, however there are four sub-categories of ‘Vegetarians’, each differing in relation to animal by-product consumption. Lacto-Ovo vegetarians consume eggs and dairy products, Lacto-Vegetarians, consume dairy products but not eggs, Ovo-Vegetarians consume eggs but no dairy products and Vegans do not consume animal by-products at all. Lacto-Ovo Vegetarian (L_o_V) is the most common category in the UK (NHS, 2017 & Vegetarian Society, 2017), which has the highest rates of vegetarianism within Europe (Ferrara et al., 2017). The National Diet and Nutrition Survey (2008 – 2012) (P.H. England, 2017) found that 2% of the general population aged 1.5 and over were vegetarian, however statistics regarding prevalence of vegetarianism in infants under 1.5yrs are not recorded. With the NHS estimating that 1.2 million UK residents are vegetarians (NHS, 2017) and the number of vegetarian parents increasing (Ferrara et al., 2017) there is likely to be a rise in the number of infants being weaned onto an L_o_V diet.

Between the ages of 0-1.5 years, dietary and nutritional needs alter due to the rapid growth and development changes occurring. Exclusive breastfeeding is recommended for the first 6 months as an “unequaled way of providing ideal food for the healthy growth and development of infants” (WHO, 2017). From 6 months, infant’s metabolism and cognitive functioning are sufficiently developed to start the transition from liquid to solid food (Sarwar, 2002; Nobel & Emmett, 2006; Rowan & Harris 2012 & Garcia et al., 2013). Breastmilk alone no longer meets the infant’s need for nutrient diversity (Patience, 2013) and iron stores accumulated in utero require replenishment (SACN, 2010). ‘Weaning’ or
'Complementary Feeding,' is defined as moving “from exclusively breastfeeding (liquid) to (solid) family foods” (WHO, 2017). The weaning transition should be “timely” and gradual (DoH, 1994; More et al., 2010; NHS, 2012 & ESPGHAN, 2017 WHO, 2017) as the infants “brain and gut are developing and maturing” (Nicklaus, 2016). Weaning should complement the continuation of breast/formula milk and be “adequate”- given in appropriate frequency, variety, consistency and amounts to ensure “an adequate nutrient intake” (WHO, 2003; Fewtrell et al., 2016). Weaning is a particularly vulnerable time (WHO, 2017) “contributing significantly to the high prevalence of malnutrition in children under five years of age worldwide” (WHO, 2017). Nutritional guidelines have therefore been devised to minimise these risks (NICE, 2008; NHS, 2017 & WHO, 2017).

The Academy of Nutrition and Dietetics recognises appropriately planned vegetarian diets as being nutritionally adequate for all stages of life and as providing health benefits which can assist in the avoidance and treatment of certain diseases (Melina et al., 2016). The British Dietetic Association (BDA) also suggests vegetarian diets can improve health and reduce the prevalence of certain diseases; Cardio Vascular Disease (Craig, 2009) and Type 2 Diabetes, (BDA, 2014). Health care professionals (HCP’s) however, need to be mindful of research indicating that nutritional deficiencies may occur in infants weaned onto particularly restrictive/insufficiently balanced vegetarian diets (SACN, 2011). Increased risk of restricted growth, long lasting effects of stunting and neurological function inadequacies have been observed (Innis, 2014). Furthermore, Haddad & Tanzaman (2003) found Niacin, B12 and Zinc concentrations were “significantly lower in diets of those who reported [consuming] no meat”. The BDA highlight the necessity for adequate nutritional knowledge, appropriate education and planning in a vegetarian diet (BDA, 2014).
An Internet based study by Moore et al., (2012), investigated the knowledge of weaning guidelines amongst first time mothers, analysing formal and informal sources of weaning information and the extent of their influence on weaning decisions. The study found equal use across all ages and educational groups of the Internet to gather information. 74% of participants attained information from at least 3 sources, the most influential being health visitors, the Internet and family/friends - 26%, 25% and 26% respectively. Across all demographics, 56% mothers reported finding conflicting weaning advice from these sources. (Moore, et al., 2012). Internet usage as a source of nutritional information was examined further in research by Kennedy et al., (2016), finding an “emerging role” for technology in dietetic practice. “The majority” of participants (65.6%) in this regional study, “irrespective of their sociodemographic ... circumstances” utilised the Internet to find information on nutrition.

The research examined in relation to use of the Internet as a source of dietary and health information, has shown that a significant proportion of information is obtained by parents online, rather than directly from HCPs (Bensley et al., 2014). First-time mothers showed “strong preferences” for online information sources (George, 2005) when adjusting to parenthood and filling gaps in their knowledge. Parents were also more likely to look for information via search engines such as ‘Google’ or ‘Safari’ rather than online information provided by publicly funded health services (Moore, et al., 2012 & Kennedy et al., 2016). Whilst accurate information on vegetarian weaning is available in health publications and on the WHO, DoH and NHS websites, the quality and accuracy of nutritional advice relating to vegetarian weaning, found through general search engine results is largely unknown.
therefore, HCP’s are unable to advise parents appropriately regarding accurate sources of online vegetarian weaning information. This study therefore aims to examine the accuracy and quality of advice available on the Internet in relation to weaning an infant on a Lacto-Ovo vegetarian (LoV) diet.
Materials and Methods

Design:
A cross-sectional design was selected for this study as it was similar to the approach taken by Yeung et al., (2015), when comparing online information regarding treatment of Crohn’s disease, and to the design adopted in other studies analysing the quality of online health information (McLean & Delbridge 2010; Wasserman et al., 2014; Fahy et al., 2014; Weymann et al., 2015; Ateeq & Alkadi, 2017).

This study was approved by the Cardiff School of Health Sciences Ethics Panel/Committee of Cardiff Metropolitan University N²: 9222 prior to data collection (see appendix 1). Information obtained was within the public domain and websites were anonymized to prevent any potential commercial sensitivity.

Sampling:
The search to obtain a sample group of websites for evaluation was undertaken between November and December 2017. The objective was to obtain a sample group that would be representative of web sites found by a parent in the UK, seeking online information in relation to LoVW. A search engine was used as they have an “emerging role” when accessing public healthcare information (AlGhamdi & Moussa, 2012; Beck et al., 2014; Pehora et al., 2015; Shroff et al., 2017). ‘Google’ was selected as it is the “leading search engine” in the UK, with a market share of 83.49%, (July 2017) (Weymann et al., 2015; Statista, 2017), it has
also been shown to be the most frequently accessed and valid search engine in the UK (Wang et al., 2012; Inetstart, 2017).

Search term key words were chosen having considered studies by Eysenbach and Wyatt (2002) and Roche and Skinner (2009), analysing Internet seeking behaviours. Eysenbach and Wyatt (2002) found that 65% of participants used one search phrase, whilst Roche and Skinner (2009), found that parents used short phrases and direct keywords to find health information. Similar findings regarding short search terms were made in studies relating to Internet use by Grant et al., (2015) and Lambert et al., (2017). Reflecting on the findings of these studies and using clinical judgement, three direct and short phrases were chosen to replicate search terms that parents might use when searching for nutritional advice on L_{OVW}: “vegetarian weaning”, “vegetarian infants” and “weaning onto a vegetarian diet”. The word “babies” was excluded as a search term due to the age related to weaning being ‘6 months.

The three key word searches were completed on a computer with no history or HTTP cookies to avoid influencing results. The searches were repeated three times using the same key words, over the two-month period- as per Ethics guidelines, November – December 2017, to check for consistency, updates, or any change in rankings which affected search results, however websites and webpage links were the same.

The sample group of websites was selected using the ‘convenience’ sampling method. Eysenbach and Wyatt’s (2002) study had found that 97% of participants clicked on a link within the first 10 search engine suggestions and that medical portals or sites from medical
societies were not usually the public’s first point of call, whilst Fiksdal et al., (2014) found that websites with familiar commercial endorsements were more likely to be viewed than government webpages. Therefore, to include a range of website types in the sample group, (healthcare/ government/professional bodies/parenting groups/vegetarian organisations), the first 2 pages of each keyword search results were used to obtain approximately 20 results per search.

An Inclusion/Exclusion Criteria was devised, similar to that used by Gorczynski & Patel (2014) and McLean and Delbridge (2010). The exclusions were duplications, irrelevant sites, recipe sites, books, chat rooms, blogs and sites where a membership payment was required (Appendix 2). Chatrooms and blogs were excluded as although Fiksdal et al., (2014) study, found there was interest in websites relating to other people’s experiences, regarding health information, initial analysis indicated they did not meet the assessment criteria. Any overseas health websites in the search results were included, although Fiksdal et al., (2014) found domestic health sites were trusted more than foreign ones. If a website appeared more than once, but the webpage had different content, the data was included, reflecting a parent’s ability to gather and combine information. This investigation focused on analysis of information available directly via the search result link, rather than analysing the entire content of each website. The term ‘webpage(s)’ therefore refers to that specific information.

To enable search results and raw data to be analysed and presented in a way which would allow anonymity of the actual websites/webpages and reduce potential commercial
sensitivity, 2 main categories were identified – Health Care Professional (HCP) and Non-HCP (NHCP).

**Research Tools and Scoring:**

Two research tools were required to meet the aims and objectives evaluating accuracy, and nutritional quality of online information in relation to LoVW. Whilst some generic tools exist for health quality analysis, they can be selective, not fully representative or inappropriate - for example, the DISCERN (2012) tool, was designed for experienced health care professional use (Charnock *et al.*, 1999; Dubowicz & Schulz, 2015). Therefore, two unique tools were developed, specific to the research question. This approach was consistent with Beaunoyer *et al.*,’s (2017) study examining the evaluation techniques for online data, which proposed utilising multiple assessment tools to “*optimise assessment strategies*”.

The Accuracy research tool (See appendix 3), was developed incorporating aspects of the ‘DISCERN (2012) assessment tool’ (Charnock, 1998); the EIOPA (2014) assessment tool; the Stanford Guidelines for Website Credibility (Fogg, 2002); and the ‘5 Cs website Evaluation Tool’-Construction, Content and Clarity (Roberts, 2010). The tool devised assessed each webpage against 5 categories; Credibility, Evidence Base, Reliability, Validity and Readability, to determine Webpage accuracy.

- The Credibility category criteria were devised using aspects of studies which had considered the effect of source credibility on quality perception and trust (Rains & Karmiel, 2009; DISCERN, 2012; Sbaffi & Rowley, 2017). Author qualification, bias and professional approval were examined.
• The Evidence base category considered references and presentation of information, drawing from findings in studies relating to evaluating evidence in public health interventions (Rychetnik et al., 2002) and the HEN Report 54, which examined evidence used in health information decision making (Blessing et al., 2017).

• The reliability category criteria focused on identification of any bias/advertising/sponsorship that could reduce reliability of the website, encompassing the suggestion/recommendation of the UK governmental office for quality (OfQual, 2013).

• The validity category criteria examined trustworthiness of information, using 4 specific criteria - publication date, currency of information, updates since original publication and signposting to HCP sources for further information. The first three being based on findings of research regarding information validity (Bates et al., 2006; Blessing et al., 2017).

• The readability criteria analysed clarity of information and signposting to professional information as well as a FLESCH reading ease analysis (FRE), to determine if content was appropriate for the average UK reading level (ONS, 2017).

The Accuracy tool analysed 24 points in total using a binary scoring system – 1/0 for answers as indicated. (see appendix 4). This was based on systems used in previous research studies (Weymann et al., 2015). The maximum score available was 20.

The Quality tool designed to answer the second part of the study aim, was devised as an audit/checklist of nutritional key points in relation to weaning an infant on an LøVW diet. It was created using relevant evidence-based guidelines from authoritative bodies.
including DoH (1988), WHO (2004 & 2005), NICE (2014), BDA (2016) & SACN (2017). The principal factors of importance during weaning, timing, practicalities, textures and nutritional composition of weaning foods, apply universally to infants. Key nutritional aspects specific to LoVW were identified as;

1. Balance and planning
2. Impact of the higher fibre content of vegetarian diets
3. Significance of nutrients; Fe, protein & Ca
4. Importance of specific vitamins and minerals; C, D, B12, Se, Zn, I, Omega 3.

The quality tool analysed 24 points using the same binary scoring system for consistency across both aims scoring 1/0 for each point. The maximum combined score for Accuracy and Quality was 44 points. Once results had been obtained, an independent verification was undertaken to ensure consistency of results if analysed by a third party.
Results

Sample group

A sample group of 20 websites met the inclusion criteria from the 60 sites available (Appendix 2). The key word search “vegetarian infants,” provided 40% of the sites within the sample group (Graph 1) and 25% of websites (3 HCP, 2 NHCP), appeared on all searches. Website origins were analysed and 60% were UK based (Table 1).

The sample group split was HCP, 55%, NHCP, 45%. The groups were sub divided into four different types; Health Care Websites, (HCW) 40%, Health Care Journals (HCJ) 15%, Parenting Websites (PW) 40%, Vegetarian Websites (VW) 5% (Appendix 5, Graph 2). One vegetarian website was grouped within HCW as it was provided by a healthcare professional body.

![Graph 1: Website Occurrence Percentage by Keyword Search Term](image)
**Webpage Accuracy.**

**Overall webpage Accuracy scores were HCP 80%, NHCP 52%.** The average Accuracy score was 67%. Results were analysed further by origin UK: Overseas and in respect of each criteria on the Accuracy Tool (Graph 4).

Accuracy results in respect of the **UK and Overseas** HCP webpages were identical (80%), however the UK NHCP webpages scored 60%, compared to overseas NHCP webpages 35% score (Graph 3, Appendix 5).

### Table 1 Website Origin Analysis.

<table>
<thead>
<tr>
<th>Website type</th>
<th>UK (%)</th>
<th>Overseas (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCP (HCW/HCJ)</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>NHCP (VW/PW)</td>
<td>30</td>
<td>15</td>
</tr>
</tbody>
</table>

![Graph 4](image)
The mean credibility score was 75%. Full marks were obtained by 55% of webpages and HCP’s obtained higher scores. Within the NHCP’s, 3 webpages had professional approval, therefore of the sample group (70 %) of websites provided approved information.

Evidence base scores across the HCP sites were 85% and NHCP sites 67%. Information was clearly presented across all webpages, however within these scores only 35% of webpages disclosed references.

Maximum reliability scores were achieved by 70% of webpages, the remaining 30%, all within the PW group, had funding/sponsorship bias (Graph 5, Appendix 5).

The validity score was low as only 20% of webpages provided information which had been updated within the past year, and only 30% provided next review dates. However, signposting to further information/HCP was provided on 80% of webpages resulting in a mean score of 46%.

Within the top 6 readability scores were 5 PW’s and 1 HCW, one PW achieved 100%. The overall scores across website groups were similar and the mean was 66%. FRE scores showed that only 20% of webpages, (all UK PW’s), met the ONS (2017) website FRE score recommendation (See appendix 6). Information provided by Health Care professionals overall did not meet the appropriate recommendations for website reading ease scores 70+.

The overall score for webpage accuracy was HCP 80% and NHCP 52%, the average accuracy score was 67%. When analysed by the 4 website sub groups, HCW and HCJ Scores
were identical (80%), whilst VW and PW scores were much lower (55%, 51%). (Graph 6 Appendix 5). The level of contrast in each criteria between the HCP and NHCP webpage scores is indicated in Table 2. Webpages provided by HCP’s had greater accuracy than those provide by NHCP’s.

<table>
<thead>
<tr>
<th>Category</th>
<th>(HCP) HCW/HCI %</th>
<th>(NHCP) PW/VW %</th>
<th>Significance</th>
<th>Null Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credibility</td>
<td>98</td>
<td>47</td>
<td>P=0.0001</td>
<td>Reject</td>
</tr>
<tr>
<td>Evidence Base</td>
<td>85</td>
<td>67</td>
<td>P=0.0671</td>
<td>Retain</td>
</tr>
<tr>
<td>Reliability</td>
<td>67</td>
<td>37</td>
<td>P=0.0101</td>
<td>Reject</td>
</tr>
<tr>
<td>Validity</td>
<td>64</td>
<td>25</td>
<td>P=0.0061</td>
<td>Reject</td>
</tr>
<tr>
<td>Readability</td>
<td>57</td>
<td>56</td>
<td>P=1.0000</td>
<td>Retain</td>
</tr>
<tr>
<td>Overall Total</td>
<td>80</td>
<td>52</td>
<td>P=0.0020</td>
<td>Reject</td>
</tr>
</tbody>
</table>

Using SPSS to analyse the overall accuracy results, P values were obtained using the Mann-Whitney Test. P values of 0.05 and below reflected the strength of the data in relation to the null hypothesis. Table 2 credibility, reliability and validity showed a significant difference between HCP and NHCP results. This demonstrated confidence in results showing that there is a difference between the two groups. P Values above 0.05; Evidence Base and Readability showed no significant difference.

**Webpage Quality**

**Overall webpage Quality scores were HCP 62%, NHCP 50%.** The average Quality score was 56%. Results were analysed further by Origin UK: Overseas and in respect of each criteria on the Nutrition Quality tool.
Quality results in respect of **UK and overseas** HCP and NHCP sites were higher (63%) than the results for overseas sites (48%).

The mean score was 77% across all website groups. 50% of webpages scored full marks, indicating that with planning, an LoVW diet could provide a balanced healthy diet to infants age 6months+.

Information highlighting the impact of the high **fibre** content of vegetarian diet - reduced vitamin absorption and satiety before energy needs are met, was only included on 25% of webpages. These were all UK based sites, (4 HCP 1 approved PW).

The **Iron** mean score was high – 76%, with half of the sample group scoring 100%. The importance of Iron was included on 95% of webpages and 80% detailed iron rich food sources. The role of vitamin C in relation to iron absorption and the increased risk of iron deficiency anemia were included on 65% and 55% webpages respectively.
Protein was the highest scoring criteria, with 65% of webpages scoring 100%. One HCW site and one PW site failed to provide any information regarding the importance or function of protein or alternative sources within an LwVW diet, so the mean score was reduced to 78%.

Although 75% of sites suggested Calcium sources and 60% detailed non-dairy sources, information regarding its nutritional importance in relation to bone growth was only included on 35% of websites. The mean score for this nutrient was therefore 57%.

The mean score for Vitamins was 64%, however 5 webpages scored 100% (4 HCP, 1 PW). Information regarding sources of Vitamin B12 and its deficiency in LwVW diets were most frequently covered (75% and 70% respectively). DoH recommendations re Vitamin A, C, D supplementation were included on 65% of webpages including all UK HCP sites, however two overseas HCP’s omitted these recommendations. The importance of Vitamin D was emphasised on 60% of webpages and 50% gave examples of food sources.

Minerals were the lowest scoring category. Zinc was discussed on 45% of webpages and Omega 3 sources suggested on 15%. Omega 3 recommendations, Selenium and Iodine were only included on 1 webpage each.

The Overall webpage Quality scores were HCP 62%, NHCP 50%, the average Quality score was 56%. Across the 4 website groups, scores from highest to lowest were HCJ 75%, VW, 63%, HCW 57%, PW 48%, (Graph 8 Appendix 5). The level of contrast in each criteria
between the HCP and NHCP webpage scores are indicated in Table 3. Overall the Webpages provided by HCP’s were of greater quality nutritionally than those provided by NHCP’s.

### Table 3 Comparison between overall Quality of HCP and NHCP Websites

<table>
<thead>
<tr>
<th>Category</th>
<th>(HCP) HCW/HCI %</th>
<th>(NHCP) PW/VW %</th>
<th>Significance</th>
<th>Null Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>85</td>
<td>67</td>
<td>P=0.370</td>
<td>Retain</td>
</tr>
<tr>
<td>Fibre</td>
<td>59</td>
<td>39</td>
<td>P=0.261</td>
<td>Retain</td>
</tr>
<tr>
<td>Iron</td>
<td>82</td>
<td>69</td>
<td>P=0.331</td>
<td>Retain</td>
</tr>
<tr>
<td>Protein</td>
<td>86</td>
<td>67</td>
<td>P=0.201</td>
<td>Retain</td>
</tr>
<tr>
<td>Calcium</td>
<td>67</td>
<td>44</td>
<td>P=0.201</td>
<td>Retain</td>
</tr>
<tr>
<td>Vitamins</td>
<td>73</td>
<td>53</td>
<td>P=0.331</td>
<td>Retain</td>
</tr>
<tr>
<td>Minerals</td>
<td>11</td>
<td>20</td>
<td>P=0.261</td>
<td>Retain</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>50</td>
<td>P=0.095</td>
<td>Retain</td>
</tr>
</tbody>
</table>

HCP scores were higher than NHCP scores, however SPSS P values indicate results were not statistically significant as average scores, were not significant enough to show a difference.

**Combined Accuracy and Quality Results:**

The combined overall score for accuracy and quality was HCP 70%, NHCP 51% . The HCP webpages were of higher Accuracy and Quality than NHCP webpages. The separate results for each element, Accuracy and Quality are in Table 4.

### Table 4 Overall comparison between overall accuracy and quality of HCP and NHCP Websites

<table>
<thead>
<tr>
<th>Aim</th>
<th>HCW/HCI</th>
<th>PW/VW</th>
<th>Significance</th>
<th>Null Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Accuracy</td>
<td>80</td>
<td>52</td>
<td>P=0.002</td>
<td>Reject</td>
</tr>
<tr>
<td>2: Quality</td>
<td>62</td>
<td>50</td>
<td>P=0.095</td>
<td>Retain</td>
</tr>
</tbody>
</table>
The highest Overall Accuracy and Quality score was obtained by a UK based HCW, which scored 82%. Within the next top 4 results, 2 HCJ’s scored 80%, and an approved UK based PW, scored 77%. The lowest overall score of 27% was an approved overseas PW.

When analysed by website group the rankings from highest to lowest were HCJ (77%), HCW (68%), VW (59%) and PW (49%). When compared by Origin, the UK webpages achieved a combined score of 66% whilst the Overseas combined score was 55%.
Discussion

The Internet is often a primary source of data for individuals seeking health information (Leiffers et al., 2014 & Kennedy et al., 2016) particularly in relation to infants (Bensley et al., 2014). This cross-sectional study aimed to analyse the accuracy and quality of advice regarding LcVW, available to UK parents online. Therefore two main aims with suitable objectives were devised to answer the research question.

The Accuracy Assessment Tool focused on credibility, reliability, evidence base, validity and readability. The Quality Assessment Tool was a nutritional checklist compiled from weaning guidelines and recommendations provided by authoritative bodies; DoH (1988), WHO (2004 & 2005), NICE (2014), BDA (2016) & SACN (2017). The Overall results were as expected; information provided by HCP’s was of a higher accuracy and quality than information provided by NHCP’s. However, within the top 3 scores there was one NHCP source (PW), demonstrating that some NHCP’s provide information of greater accuracy and quality than HCP sources. The
sample group was made up of HCP (55%) and NHCP (45%) websites. Research indicates that parents are more likely to access NHCP sources than those of the HCP’s (Moore et al., 2012; Kennedy et al., 2016). The readability results showed that information provided by the HCPs was not at an appropriate reading level to meet ONS recommendations for general readability, whereas NHCP sources, particularly UK based PW’s, met the readability recommendations (see appendix 6).

Studies on Internet search behaviours (Eyesenbank & Wyatt, 2002) found that 65% of users seeking health information online use one short phrase, 70% of the websites in the sample group appeared using the keyword search term “Vegetarian infants”. 20 results for each search were included providing a wide range of websites for analysis, links above the 20th degree of separation tended to be irrelevant and of no value to the research, this was consistent with findings of Fiksdal et al., (2014). Webpage origins were often not apparent, however there was a relatively high chance (40%) of parents accessing overseas webpages. The overall accuracy and quality scores show that overseas websites, particularly those provided by NHCP’s were far lower than the UK based NHCP’s.

Internet fluidity is not reflected in the results highlighting a limitation of this study (Abu-Elkheir et al., 2013; Grant et al., 2015), as cross-sectional studies capture information available at a static point, this limitation was minimised as analysis occurred over two months.

Web based resources are perceived as a widely accessible, convenient and transportable information source (Kennedy et al., 2016). Research indicates parents are more likely to access parenting/familiar commercially endorsed sites (Fiksdal et al., 2014) leading to
possible “conflicting or erroneous advice” being obtained. The accuracy tool considered a range of criteria to determine overall accuracy. When considering credibility it was important to consider bias and objectivity. Information on 70% of the websites was written/approved by HCP’s or professional bodies, therefore it can be concluded; individuals are most likely to obtain credible information. The lack of detail regarding evidence base/references on 65% of websites indicates a need to improve standards of online information. This is consistent with the findings of Tonsaker (2014) which concluded that the onus is on HCP’s to ensure the availability of legitimate and trustworthy information. Patience (2013) and Ferrera et al., (2017) proposed HCPs should play “proactive roles” in distributing/regulating information and advice. Pradignac et al., (2011) suggests HCP’s should have an enhanced knowledge and an appreciation/awareness of the influence of online health information.

When considering validity, results show that only 20% of websites were updated within the past year. A limitation was highlighted, as HCJ articles would not be regularly updated. This limitation was not significant as guidelines in relation to vegetarian weaning have been fairly static; NICE (2014) NHS (2015), BDA (2016) and WHO (1988 & 2018). Analysis of the validity and quality scores showed websites updated within the past year had higher checklist scores indicating there was a correlation between the accuracy and quality results. This indicates a need for HCP’s to develop an online review process for website information to enable users to see how current the information is.

Internet usage for health information is common across all socioeconomic groups (Moore et al., 2012) therefore HCP websites intended for public use, need to be accessible to
audiences with a range of learning styles and education levels. Readability of information was one area where NHCP’s had higher scores than HCP’s which is consistent with findings of other studies (Nasser et al., 2012 & Taki et al., 2015). This suggests a need for HCP’s to review the style of writing and language adopted in online health information to meet the FRE score recommendation (ONS, 2017). This would promote the use of HCP sites in preference to NHCPs, as current research indicates that parents are more likely to access familiar commercially endorsed websites, than online information provided HCPs (Moore et al., 2012; Kennedy et al., 2016).

Across the sample group Planning was the most frequently discussed topic, 95% of the sample group indicating that an LØV diet could be balanced and healthy if well planned. Information regarding weaning age was also appropriate and provided on 65% of webpages. Information was consistent with BDA (2014) advice regarding the necessity of parental nutritional knowledge to ensure a healthy balanced diet is provided and to prevent nutritional deficiencies. This is of particular importance during the vulnerable period of weaning when rapid growth and development occur (DoH, 1994; WHO, 2017).

A primary purpose of weaning is to increase energy content and enrich nutrients such as iron in the infant diet (Garcia et al., 2013). Nutrient stores from birth have depleted and rapid tissue growth during infancy increases iron requirements (SACN, 2010). It is therefore recommended that “>90% of the iron requirements of a breast-fed infant must be met by complementary foods” (Agostoni, et al., 2008) so that sufficient bioavailable iron can be absorbed. Although advice relating to the importance of iron was provided on 95% of webpages and appropriate food sources for an LØVW diet were suggested, the role of
Vitamin C in relation to iron absorption and the risk of iron deficiency anaemia were less likely to be covered (25%). The overall score for Iron was 76% with all HCPs and NHCPs scored over 55%, indicating the information was in line with weaning recommendations.

Protein scores were the highest across the sample group (78%), indicating that HCPs and NHCPs provided advice about the importance of protein for growth and development. Many vegetarian protein sources are ‘incomplete proteins’, therefore the DoH (1994) recommend that vegetarian infants consume “a minimum” 2 portions of protein per day from 8 months onwards so that sufficient essential amino acids are supplied. Information regarding protein sources was suggested on 85% of webpages.

The British Paediatric Association (1988) special report into vegetarian weaning recommends that infants and young children should “receive a sufficient amount (500 ml)” of dairy products per day (NSCBPA, 1988). This message was reiterated on 75% of webpages however reasons linking the importance of calcium were only provided on 35% of webpages. Despite recommendations being incorporated, explanations regarding the rationale are missing, therefore parents may fail to follow/appreciate the necessity of these recommendations. Current weaning advice focuses on practicalities – age, textures, variety instead of ensuring nutritional recommendations are present. A need for clear nutritional information as displayed in the nutritional research tool devised (appendix 4) for specific diets is therefore necessary.

Recommendations on fibre and the awareness of potentially low energy and fat content of an LwVW diets were disclosed on 50% of webpages. Caution must be taken within a
vegetarian weaning diet, as the high fibre content (BNF, 2017) can result in early satiety before sufficient calories and nutrients are consumed (Patience, 2013). Information regarding the impact of fibre on vitamin absorption was also frequently omitted scoring only 25%. Contrasting this, recommendations regarding Vitamins D and B12 and their sources tended to be covered. Mineral recommendations had the lowest compliance scores (15%), with omega 3 sources and zinc being the only elements incorporated into the advice provided. The lack of advice in relation to nutrients could potentially lead to deficiencies if parents relied primarily on webpages.

Whilst the responsibility for nutrition during childhood lies with parents (Patience, 2013), all HCPs, including paediatricians, have been encouraged to take a “proactive” educational role in assisting parents, particularly with restrictive diets, to enhance parental knowledge of the nutrients required to meet the developmental needs of the infant (Ferrara et al 2017; Patience, 2013). The Internet can be used as an effective tool to assist in disseminating information to a wide audience, whilst advice provided by HCP’s remains accurate and of high quality, the information contained was targeted at a higher than average readability level, compromising their accessibility and usability.

This study provides an overview of the accuracy and quality of online information regarding LoVW which may enable HCPs to appropriately advise parents on sound LoVW information. The overall results show that HCP’s provide information of greater accuracy and quality, however, the advice was not at an appropriate level for widespread understanding. In comparison an NHCP parenting site, provided information at an appropriate level, far higher score than many HCP sources. There was also a wide variation across HCP sites in the
The amount of nutritional information provided. This was a potential limitation as some HCW and HCJ webpages were topic specific rather than designed as general guidance on LVVW. This indicated a need for HCP’s to consider developing specific standards as proposed by Tonsaker et al., (2014). Conversely, increasing availability of quality information and providing HCP webpages with appropriate readability levels is essential to encourage parental use of online HCP information sources in preference to NHCP sites which generally had lower overall accuracy and quality.

**Word Count: 5500.**
References


ESPGHAN (European Society for Paediatric Gastroenterology, Hepatology, and Nutrition
Journal of Pediatric Gastroenterology & Nutrition 64(1) pp.119.


Public Health England & Food Standards Agency (2017) ‘Results from Years 1, 2, 3 and 4 (combined) of the Rolling Programme (2008/2009-2011/2012) Government Uploads Available at:


SACN (2010) ‘Iron and Health’ TSO pp. 40-43 Available at:

*Journal of Human Nutrition and Dietetics* 15(6) pp. 948-961.


Waymann, N., Dirmaier, J., Wolff, A., Kriston, L & Harter, M (2015) ‘Effectiveness of a Web-Based Tailored Interactive Health Communication Application for Patients with Type 2 Diabetes or Chronic Low Back Pain: Randomized Controlled Trial’ *Journal of Medical Internet Research* 17(3) pp. 53.


Appendices:
Appendix 1: Ethics Form Approval

Wednesday, 28 June 2017

BSc (Hons) Human Nutrition & Dietetics
Cardiff School of Health Sciences

Dear Applicant

Re: Application for Ethical Approval: Vegetarian Weaning: An investigation into the quality of nutritional information available on Internet websites for vegetarian mothers on weaning practices

Project Reference Number: 9222

Your ethics application, as shown above, was considered by the Health Care and Food Ethics Panel on 28/06/2017.

I am pleased to inform you that your application for ethical approval was APPROVED.

Minor issues may still need addressing before you commence any work – if so these will be listed below.

N/A

Where changes to the information sheet, consent form and/or procedures are deemed necessary you must submit revised versions to the relevant ethics inbox. If you are a student – your supervisor must do this on your behalf.

Note: Failure to comply with any issues listed above will nullify this approval.

Standard Conditions of Approval

1. Your Ethics Application has been given a Project Reference number as above. This MUST be quoted on all documentation relating to the project (e.g. consent forms, information sheets), together with the full project title.

2. All documents must also have the approved University Logo and the Version number in addition to the reference and project title as above.

3. A full Risk Assessment must be undertaken for this proposal, as appropriate, and be made available to the Committee if requested.

4. Any changes in connection to the proposal as approved, must be referred to the Panel/Committee for consideration without delay quoting your Project Reference Number. Changes to the proposed project may have ethical implications so must be approved.

5. Any untoward incident which occurs in connection with this proposal must be reported back to the Panel without delay.

6. If your project involves the use of human samples, your approval is given on the condition that you or your supervisor notify the HTA Designated Individual of your intention to work with such material by completing the form entitled “Notification of Intention to Work with Human Samples”. The form must be submitted to the PD (Sean Duggan), BEFORE any activity on this project is undertaken.
Appendix 2 Flow chart exclusion/Inclusion Criteria:

Websites sources via Google

Key word search “vegetarian weaning” N= 918,000

Number of websites on the first 2 pages N= 20

Keyword search “weaning onto a vegetarian diet” N= 225,000

Number of websites on the first 2 pages N= 20

Keyword search “Vegetarian Infants” N= 5,190,000

Number of websites on the first 2 pages N= 21

Total Websites for Analysis N= 61

Duplication Exclusion N=12

Websites analysed on exclusion/inclusion criteria N= 

Exclusion Criteria

Websites excluded N= 29

Vegan Specific = 2
Chat Rooms = 2
Recipe Sites= 9
Membership Sites= 1
Blog Sites= 3
Newspaper= 3
Books= 5
Not Relevant= 4

Total Websites Eligible for analysis N= 20
Appendix 3: Accuracy Research tool. Maximum points available : 20

Credibility

Highest Credibility Score = 5

1. Has the author been identified? (+1 / 0) yes = 1

2. Is the author qualified on this subject? (+1 / 0) yes= 1

3. Has the website been affiliated by nutritional/ scientific groups? (+1 / 0) yes = 1
4. Are the contact details of the publisher provided in the ‘about’ or ‘contact us’ section?  
(+1 / 0) yes = 1

5. Is there any branding/ biased advertising? (0/1) yes=0

Evidence Base:  
Highest Accuracy Score = 3

1. Is the website free from grammatical or spelling errors? (+1 / 0) yes = 1

2. Is the aim of the website laid out clearly with headings identified? (+1 / 0) yes = 1

3. Are references/ bibliographies disclosed? (+1 / 0) yes = 1

Reliability:  
Highest Reliability Score = 2

1. Has the website been funded by any specific brand? (0 / 1) yes = 0

2. Has the website been sponsored by any companies? (0 / 1) yes =0

3. If yes to either of above - Have any conflicts of interest been disclosed? (0 / +1) yes =1

Validity:  
Highest Quality Score = 4

1. Has the website publishing date been displayed? (+1 / 0) yes = 1

2. Is there information on the date for the next update? (0 /+1) yes = 1

3. Does the website signposts HCP websites/text? (+1 / 0) yes = 1
4. Has the website been updated within the past year? (0 /+1)

Readability:     Highest Readability Score = 6
1. Are the keywords present in the title or subheadings? (+1 / 0) yes = 1
2. Is the use of jargon present? (0/1) yes = 0
3. Is jargon fully explained? (+1/0) yes = 1
4. Does the website include pictorial guidance/ideas (+1/0) yes = 1
5. Is there opportunity to access/download relevant literature? (+1/0) yes = 1
6. Is further support or guidance signposted? (+1/0) yes = 1
7. Is the FRE Score 70 or above? Yes = 1
Appendix 4: Research Tool 2: Checklist.

‘Vegetarian weaning guide checklist components’

Evidence based guidelines; (BDA, 2016) & (NHS, 2015).

Planning

• Vegetarian weaning can form a balanced, healthy diet
• Planning a vegetarian diet is important
• Weaning should start around 6 months

Fibre

• Awareness of high fiber low energy and vegetarian diets
• Fibre reduction of vitamin absorption

Iron

• Importance of Iron
• Iron-Deficiency Anemia associated with vegetarianism
• Sources of Iron – including fortified cereals
• Importance of Vitamin C to enhance iron absorption

Protein

• Protein importance & function
• Protein sources suggested
Calcium

- Calcium and bone growth
- Sources of Calcium suggested
- Non-dairy sources of calcium

Vitamins

- Vitamin D importance
- Vitamin D sources suggested
- DoH Recommendation of supplements for children under 5
- Awareness of Vitamin B12 deficiency and vegan diets
- B12 sources/ supplements

Minerals

- Omega 3 recommendation- 2 portions/week
- Sources of Omega 3 suggested
- Zinc suggested
- Selenium suggested
- Iodine suggested

Yes = 1 point per question. Maximum points available - 24
Appendix 5: Graph 2

Graph 2: Percentage Split of Website Groups.
Graph 3 Aim1 Overall Accuracy
UK: Overseas
HCP: NHCP

1=UK figures
2= Overseas figures

Percentage

1
2

80
60
35

HCP & HCJ
VW & PW
Graph 5: Percentage Reliability Score by Website Group.

Graph 6: Aim 1 - Overall Accuracy Results by Website Group.
Graph 8: Overall Quality score for Nutrition Checklist

- HCW mean scores: 57
- HCJ: 75
- VW: 63
- PW: 48

Website Groups
Appendix 6: FRE scores and breakdown for all websites

<table>
<thead>
<tr>
<th>Website</th>
<th>FRE Score</th>
<th>Grade Level</th>
<th>Age Level</th>
<th>Appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>70.0</td>
<td>6</td>
<td>11-12 years</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>70.3</td>
<td>7</td>
<td>12-13 years</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>70.5</td>
<td>7</td>
<td>12-13 years</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>59.8</td>
<td>9</td>
<td>14-15 years</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>66.0</td>
<td>7</td>
<td>12-13 years</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>58.9</td>
<td>8</td>
<td>13-14 years</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>70.8</td>
<td>7</td>
<td>12-13 years</td>
<td>1</td>
</tr>
<tr>
<td>H</td>
<td>66.6</td>
<td>7</td>
<td>12-13 years</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>65.7</td>
<td>7</td>
<td>12-13 years</td>
<td>0</td>
</tr>
<tr>
<td>J</td>
<td>55.6</td>
<td>11</td>
<td>16-17 years</td>
<td>0</td>
</tr>
<tr>
<td>K</td>
<td>66.6</td>
<td>7</td>
<td>12-13 years</td>
<td>0</td>
</tr>
<tr>
<td>L</td>
<td>62.8</td>
<td>9</td>
<td>14-15 years</td>
<td>0</td>
</tr>
<tr>
<td>M</td>
<td>63.0</td>
<td>8</td>
<td>13-14 years</td>
<td>0</td>
</tr>
<tr>
<td>N</td>
<td>59.8</td>
<td>8</td>
<td>13-14 years</td>
<td>0</td>
</tr>
<tr>
<td>O</td>
<td>52.1</td>
<td>10</td>
<td>15-16 years</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>51.6</td>
<td>11</td>
<td>16-17 years</td>
<td>0</td>
</tr>
<tr>
<td>Q</td>
<td>62.6</td>
<td>10</td>
<td>15-16 years</td>
<td>0</td>
</tr>
<tr>
<td>R</td>
<td>44.1</td>
<td>10</td>
<td>15-16 years</td>
<td>0</td>
</tr>
<tr>
<td>S</td>
<td>55.3</td>
<td>12</td>
<td>17-18 years</td>
<td>0</td>
</tr>
<tr>
<td>T</td>
<td>67.9</td>
<td>7</td>
<td>12-13 years</td>
<td>0</td>
</tr>
</tbody>
</table>
Appendix 7 : SPSS Raw Data Screen Shots using Mann-Whitney Tests.
<table>
<thead>
<tr>
<th>Null Symptom</th>
<th>Test</th>
<th>Flag</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table contains null data.

To view more information, expand the table.