

# Momordica Charantia (Bitter Melon): Safety and Efficacy During Pregnancy and Lactation

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Received: August 1, 2018

Accepted: August 16, 2018

Online Published: August 21, 2018

doi:10.20849/ijns.v3i2.454

URL: <https://doi.org/10.20849/ijns.v3i2.454>

## Abstract

**Background:** The leaf, fruit, and bark of *Momordica charantia* (MC) (Common name. *Bitter Melon*). (Cucurbitaceae) has been used extensively in folk medicine as a remedy for diabetes. Biological and pharmacological activities attributed to different parts and extracts of these plants include anti-HIV, wound healing, anti-helminthic, anti-genotoxicity, larvicidal, antiviral, antimicrobial, anti-obesity, antifertility, anticancer, antidiabetes, antidiarrheal.

In Nigeria, a decoction of the leaves or bark is used in folk medicine to manage diabetes. Pregnant and lactating women have been observed, consuming the extract of MC for its folkloric belief as an antidiabetic agent. But its potential for toxicity when administered during pregnancy, lactation and breast feeding has not been completely investigated. The present study was aimed to review the literature for evidence on the use, safety, efficacy and pharmacology of *Momordica charantia* during pregnancy and lactation.

**Methods:** Seven electronic databases including the Napralert database were searched. Data were compiled based on the grade and evidence found.

**Results:** There were no scientific evidence to support the use of *Momordica charantia* during pregnancy and lactation. However animal studies in both rodents and primates show that the plant extract, induce abortion. In males, seed extracts of *M.charantia*, showed indirect evidence of reduced availability of pituitary gonadotrophs necessary for spermatogenesis.

**Conclusion:** Caution should be exercised with the use of *Momordica charantia* during pregnancy and lactation till human research is conducted to determine its safety. There is a need to be cautious when using preparations containing *Momordica charantia*. Implications for Nursing: Findings can be utilized by community health nurses and policy makers to advice on the use of *Momordica charantia* during pregnancy, lactation and in males in their reproductive life.

**Keywords:** *Momordica charantia*, safety, efficacy, pregnancy, lactation

## 1. Introduction

Medicinal plants have formed the basis of health care throughout the world since the earliest days of humanity and are still widely used with considerable importance in international trade (Ahvazia et al, 2012). In certain African countries, however, up to 80% of the population still relies exclusively on plants as a source of medicines (WHO, 2005). Therefore, the continuous evaluation of these botanicals for safety/toxicity using different animal models is important.

*Momordica charantia* is a tropical plant belonging to the family Cucurbitaceae. The plant is a native of South-east Asia, Africa and the Caribbean (Aiyelaagbe et al., 2010). It is a creeping plant and is widely distributed in West Africa, Indian and Japan (Kumar, 2010). *Momordica Charantia* or Bitter Melon, also known as balsam pear or Karela, is a Tropical vegetable, is a common food in Indian cuisine and has been used extensively in folk medicine as a remedy for diabetes. The Latin name *Momordica* means "to bite" (referring to the jagged edges of the leaf, which appear as if they have been bitten). (Kumar, 2010)

Momordica charantia is extensively used in traditional medicine and has become a great contributor of chemicals in modern medicine. Various parts of the plant have been investigated for biological activity. The medicinal utilities have been described, especially for leaf, fruit and bark. The bark and leaf extracts have been therapeutically used as folk medicine for abortifacient, anthelmintic, aphrodisiac, burn, catarrh, constipation, digestion, demulcent, dermatosis, diabetes, diarrhea, dyspepsia, eczema, emetic, emmenagogue, emollient, fever, febrifuge, hemorrhoids, hepatitis, hypoglycemic, inflammation (liver), leprosy, leucorrhoea, leukemia, malaria, menstrual colic, pain, pruritus, purgative, rheumatism, scabies, skin, tumor, wound, vaginitis, vermifuge, cancer (breast), food, glucosuria, halitosis, hematuria, polyuria, refrigerant, bite (snake), anemia, colitis, kidney (stone), sterility (female), dysentery, gonorrhoea, appetite stimulant, insecticide, laxative, rage, rhinitis, contraceptive, dysmenorrhoea, fat loss, galactagogue, gout, hydrophobia, piles, pneumonia, psoriasis, sore, asthma, headache, scald, sprue, stomachache, cold, cough, hypertension, tonic gallbladder, contusions, lung, measles, suppurative, rheumatoid arthritis and lupus (Kumar, 2010)

M. charantia is principally used in West Africa as a taenifuge as well as in the treatment of fever (Burkil, 1985). Medicinally, the plant is widely used for therapeutic purposes. A tea prepared from the leaf is used for diabetes, to expel intestinal gas, to promote menstruation, and as an antiviral agent against measles, hepatitis, and feverish conditions (Sofowora, 2006; Mustafa et al., 2014). It is used tropically for sores, wounds, and infections and internally and externally for worms and parasites and to treat colic (Sofowora, 2006).

Biological and pharmacological activities attributed to different parts and extracts of these plants include anti-HIV (Bourinbaier et al., 1995), wound healing (Sankaranarayanan et al., 1993), anti-helminthic (Lal et al., 1976), anti-genotoxicity (Balboa et al., 1992), larvicidal (Singh et al., 2006), antiviral (Nadkarni et al., 1993), antimicrobial (Sankaranarayanan et al., 1993), anti-obesity (Nerurkar et al., 2005), antifertility (Naseem, 1998), anticancer (kumar et al., 2010), antidiabetes (Shetty, 2005), antidiarrheal (Bakare et al., 2011)

Chemical investigation of MC, reveals the presence of dihydroxy- $5\beta$ ,19-epoxycucurbita-6,(23E)-diene; charantin, charine, diosgenin, lanosterol, lauric acid, linoleic acid, gentisic acid, gypsogenin and cryptoxanthin. Other classes of compounds, such as cucurbitins, cucurbitacins, cucurbitanes, cycloartenols, elaeostearic acids, erythrodiol, galacturonic acids, goyaglycosides, goyasaponins, guanylate cyclase inhibitors, hydroxytryptamines, karounidiols, momorcharasides, momordenol, momordicin, momordicins, momordicinin and momordicosides have been reported from this plant (Jianchao et al., 2008; Aiyelaagbe et al., 2010)

In Nigeria, decoctions and aqueous extract of MC are commonly used in the treatment of diabetes. Some women, have been seen taking aqueous extract of MC during pregnancy and lactation for management of diabetes (Osemene et al., 2011). This, calls for an in-depth understanding of its efficacy and potential for harm during pregnancy and lactation.

One of the ways to address these issues, is to do a systemic review of the literature. In this paper, we will review the effectiveness of Momordica charantia with emphasis on issues related to pregnancy, lactation and breast feeding. This paper, is a continuation of our research effort on the evaluation of the efficacy and safety of a series of commonly used Nigerian plants during pregnancy and lactation.

## 2. Methods

AHMED, CINAHL, Cochrane CENTRAL, Cochrane Library, Medline, Internet journals, Napralert database, Natural Medicines comprehensive database, and Natural standard were reviewed from inception to March 2017 for information on Momordica charantia as it relates to its use on “pregnancy”, “lactation”, and “breastfeeding”. The Latin and common name of Momordica charantia were also used as keywords in the search.

Information on the safety of this herb was searched for in the Complete German Commission E Monographs compiled by the American Botanical Council and Global Information Hub On Integrated Medicine (GLOBinMED), Natural standard monograph, and Natural Medicines, comprehensive database. Also, the safety of the active constituent of the herb was also searched. The pertinent journals were collected and the results tabulated as grade for indications of use, level for safety of consumption during pregnancy and safety of consumption during lactation. The level of evidence for therapeutic use and evidence for harm were evaluated on ‘Grades for evidence for efficacy’ and levels for evidence for harm as displayed in Tables 1 and 2 respectively (Jean-Jacques et al., 2006; Howick 2009; Alper 2010; Ulbricht 2010).

### 3. Results

Table 1. Grades for the evidence for efficacy

Studies	Grade	Reference
AntiHIV	E	Bourinbaiar, 1995
Wound healing	D	Sankaranarayanan,1993
Anti-helminthic	E	Lal,1976
Anti-genotoxicity	E	Paul, 2010
Larvicidal	E	Singh, 2016
Antiviral	E	Nadkarni, 1993
Antimicrobial	E	Sankaranarayanan,1993
Antiobesity	E	Nerurkar 2005
Antifertility	E	Naseem, 1998
Anticancer	E	Kumar, 2010
Antidiabetes	D	Shetty, 2005
Antidiarrheal	D	Bakare et al., 2011
Galactagogue	F	Kumar, 2010
Antilipids	E	Kumar, 2010

Extract of *M. charantia* has benefitted some people infected with HIV. (Aiyelaagbe et al., 2010). Extracts prepared from *Momordica charantia* plant increases insulin sensitivity and can lower elevated blood sugar levels (Aiyelaagbe et al., 2010)

Table 2. Level for evidence for harm

Studies	Levels	Reference
Abortions	3	Kumar,2010
Antiovolatory	3	Koneri,2006
Suppresses sperm production	3	Yama, 2011
Decreased production of estrogen and progesterone	3	Osonuga, 2014
reversible histological alterations in the prostate and testes	3	Boetse, 2011
Teratogenic	3	Nwachi, 2010
Gross malformation of litters	3	Nwachi, 2010
Transferred to breast milk	3	Kumar, 2010
Favism	2	Kumar, 2010

The seeds have shown to induce abortions in rats and mice while the root extract has shown a uterine stimulant effect in animals. The fruit and leaf of MC in vivo studies, produced antifertility effect in female animals. In male animals extracts from the plant, suppressed sperm production. The momorcharins a group of chemical present in the plant, are effective in inducing early and mid term abortions, but have no signs of teratogenic effects (Kumar et al., 2010)

Oral administration of the aqueous leaf extract of *M. charantia* to Swiss albino rats in eight doses of the extract (0.5-20 g/kg body weights),produced no visible signs of toxicity in the animals except for an initial huddling observed at the highest dose of 20 g/kg body weight. No mortalities were recorded in all the doses. Also,no toxic symptoms were observed and neither food nor water intake was found to be reduced during the period (4). Administration of the extracts to Swiss albino rats in six doses ranging from 0.5-5 g/kg body weight, no visible signs of toxicity in the animals, although no toxic symptom or deaths were recorded at the lowest doses of the extract (0.5 - 2.0 g/kg body weight) via this route of administration. Animals on higher doses (3 - 5 g/kg body weight) were more agitated than those on the lower doses .The LD50 obtained via the i.p. route was 2790 mg/kg (4). Nwachi et al. (2010) reported that the safety of the water extract of the unripe fruit on pregnant Sprague Dawley rats. Extract was administered on days 7, 8, 9, 10, 11, 12, 13 and 14 of gestation. The litter size was determined for each group and the litters were examined for gross malformations. The gross and histological examinations of various organs of the litters were also carried out. Results show that 8.65% of the litters from experimental animals were malformed as against 1.62% of control. It also showed that 31.2% of all the malformed litters had multiple congenital malformations. It also showed that the experimental rats had nine

resorption sites while control had none. This demonstrates that the water extract of *Momordica charantia* is teratogenic in Sprague(Nwachi et al., 2010)

The active chemicals in bitter melon have shown in animal studies to be transferred through breast milk; therefore, it is contraindicated in women who are breast feeding (Kumar et al., 2010)

### 3.1 Parts Used

Leaves, bark, seeds, and fruit of *Momordica charantia*

### 3.2 Interactions

May potentiate insulin and anti-diabetic drugs. May potentiate cholesterol-lowering drugs (Kumar et al., 2010)

## 4. Discussion

*Momordica charantia*, have been shown to possess some beneficial therapeutic effect. There are no strong clinical evidence supporting the use of MC in pregnancy or during lactation . Extracts of *M. charantia* showed some benefit with people infected with HIV (Aiyelaagbe et al., 2010). A recent scientific study confirmed that the extract of this plant increases insulin sensitivity and can lower elevated blood sugar levels (Miura et al., 2001)

Some scientific investigation, have shown ethanol and water extracts of the fruit and leaf administered orally, to be safe during pregnancy. However, other studies have shown otherwise. Toxicity studies caused death in laboratory animals when different extract s prepared from the leaves, bark, fruit and seed are administered intravenously or intraperitoneally. Greater toxicity resulted from extracts prepared from the fruit and seed compared with the leaf or aerial parts of the plant. The seed extract, induce abortions in rats and mice, while the root extract, has caused some uterine stimulant effect in animals. The fruit and leaf of bitter melon in in vivo has demonstrated an antifertility effect in female animals; suppression of sperm in male rats. In folk medicine, Bitter melon is used to induce abortion. In addition to its documented weak uterine stimulant activity, it is, contraindicated during pregnancy. *Momordica charantia*, reduce fertility in both males and females, as a result, should not be used by those undergoing fertility treatment or seeking pregnancy. In a study where various extracts (ether, benzene and alcohol) of *M. charantia* seeds, were administered orally and intraperitoneally to male rats for 35 days, result, showed a reduced availability of pituitary gonadotrophs necessary for spermatogenesis. The intraperitoneal administration, increased cholesterol and Sudanophilic lipid (Kumar et al., 2010). The seed contains vicine and therefore can trigger symptoms of favism in susceptible individuals. Some vivo clinical studies have demonstrated low toxicity of all parts of the bitter melon plant when ingested orally(Kumar et al., 2010). Toxicity, have been reported in children who consume red arils of the seeds (Kumar et al., 2010).

No risk has been reported on the use of this herb through its traditional or common use. A more rigorous and well controlled- clinical research is needed before this herb can be used during pregnancy and lactation. It is important for consumers and clinicians to know that *Momordica charantia* has the potential to interact with some prescription medications May potentiate insulin and anti-diabetic drugs. May potentiate cholesterol-lowering drugs (Kumar et al., 2010)

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## Appendix

Table 3. Grades for the evidence for efficacy

Grade	Evidence	Interpretation
A	VERY STRONG SCIENTIFIC EVIDENCE	Statistically significant evidence of benefit from one or more systemic reviews/meta-analysis
B1	STRONG EVIDENCE	Statistically significant evidence of benefit from one or more properly conducted random control trials (RCTs).
B2	GOOD SCIENTIFIC EVIDENCE	Statistically significant evidence of benefit from one or more RCTs. The RCTs, however, are either of small sample size OR have discrepancies in their methodologies
C	FAIR SCIENTIFIC EVIDENCE	Statistically significant evidence of benefit from one or more cohort studies OR outcome studies
D	WEAK SCIENTIFIC EVIDENCE	Evidence from case series
E	INDIRECT AND/OR CLINICAL EVIDENCE	Evidence from case reports OR expert opinion OR laboratory studies
F	HISTORICAL OR TRADITIONAL EVIDENCE	Historical or traditional use by medical professionals, herbalists, scientists, or aboriginal groups.

Table 4. Level for evidence for harm

Level	Evidence	Interpretation
1a	STRONG SCIENTIFIC EVIDENCE	Statistically significant evidence from one or more systematic reviews or RCTs.
1b	GOOD SCIENTIFIC EVIDENCE	Statistically significant evidence from one or more cohort studies OR control study.
1c	WEAK SCIENTIFIC EVIDENCE	Evidence from one or more case series.
2	VERY WEAK SCIENTIFIC EVIDENCE	Evidence based on case reports.
3	IN VITRO SCIENTIFIC EVIDENCE	Evidence based on scientific studies conducted on animals, insects or microorganisms OR laboratory studies on human cells.
4	INDIRECT EVIDENCE	Evidence based on scientific theory OR expert opinion.
5	UNKNOWN	No available information

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