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A SYSTEMATIC REVIEW ON DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE AND FAST DISSOLVING FORMULATIONS FOR ANTI-DIABETIC DRUGS OVER PAST DECADE

Manojkumar K. Munde [*1, 2], Nilesh S. Kulkarni [2] and Dhanya B. Sen [1]

Department of Pharmacy [1], Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara - 391760, Gujarat, India.
PES Modern College of Pharmacy (for Ladies) [2], Moshi, Pune - 412105, Maharashtra, India.

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Correspondence to Author:
Manojkumar K. Munde

Research Scholar,
Department of Pharmacy,
Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara - 391760, Gujarat, India.

E-mail: manojpcist@gmail.com

ABSTRACT: Diabetes mellitus is the heterogeneous metabolic disorder caused by the high blood sugar level. Untreated high blood sugar can damage kidneys, eyes, nerves and other organs. Type 1 diabetes mellitus disorder is caused by the lack of insulin hormone while type 2 diabetes mellitus is a disorder of insulin resistance by β cells of the pancreas. For the management of type 2 diabetes mellitus different drugs are available as single or combination forms like Pioglitazone, Repaglinide, Metformin, Voglibose, Glipizide. Several research activities were carried out for its development, formulation and evaluation by the development of controlled-release and fast-dissolving formulations. The extensive literature review revealed information related to the formulation of sustain/fast release dosage form for the antidiabetic drugs. Newer techniques were used by the researcher for the formulation of dosage forms as solvent diffusion-evaporation technique, Reverse phase evaporation technique, emulsion solvent evaporation technique and Hot melt extrusion granulation technique. The review represents the types of formulation, methods used, excipients used and evaluation parameters of developed dosage forms and their correlation with therapeutic success.

INTRODUCTION: Diabetes mellitus is the heterogeneous metabolic disorder caused by the high blood sugar level. Insulin moves sugar from the blood into cells and used as energy. Untreated high blood sugar can damage kidneys, eyes, nerves, and other organs [1]. There are two important types of diabetes mellitus.

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a) Type 1 Diabetes Mellitus: Type 1 diabetes mellitus is caused by the lack of insulin hormone. In type 1 diabetes mellitus use of insulin is required and which is given to the patient in injection form.

b) Type 2 Diabetes Mellitus: Type 2 diabetes mellitus is the common type of diabetes, and it is a disorder of insulin resistance by β-cells of the pancreas. In this condition, treatment includes the use of oral drugs, which increases the amount of insulin secreted by β-cells of pancreas [2].

There are different ways for the classification of antidiabetic drugs, which depend on nature, age, and lifestyle of the person as well as other factors [3].

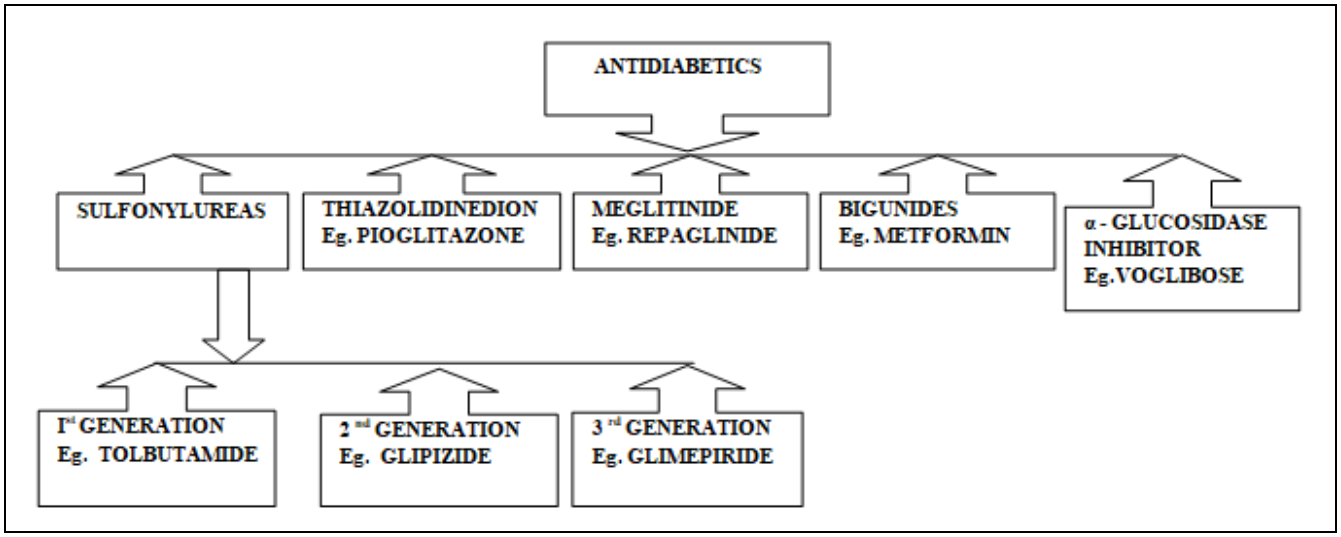

FIG. 1: CLASSIFICATION OF ANTIDIABETIC DRUGS

Glibenclamide (GB): Glibenclamide is a sulfonylurea derivative and it is used for treatment of type 2 diabetes mellitus. Its route of administration is oral. It undergoes the hepatic first-pass effect and has a short half-life. The patient has to take the drug in several divided doses to maintain the desired therapeutic effect [4].

Gliclazide (GC): Gliclazide is a sulfonylurea derivative, and it is used for type 2 diabetes mellitus. The daily dose of gliclazide is 40 mg daily and increases upto the 320 mg daily. Gliclazide has high bioavailability (100%) from tablets, and absorption is not affected by food. The half-life of this drug is approximately 11 h [5, 6].

Glimepiride (GM): Glimepiride is the first drug under third-generation sulfonylurea; it is very potent and has a long duration of action. Glimepiride is used for the treatment of type 2 diabetes mellitus. It causes hypoglycemia by stimulating the release of the insulin from pancreatic β-cells and raising the sensitivity of peripheral tissue to the insulin. Glimepiride also has an ability to promote the movement of sugar from the blood to the β-cells [7].

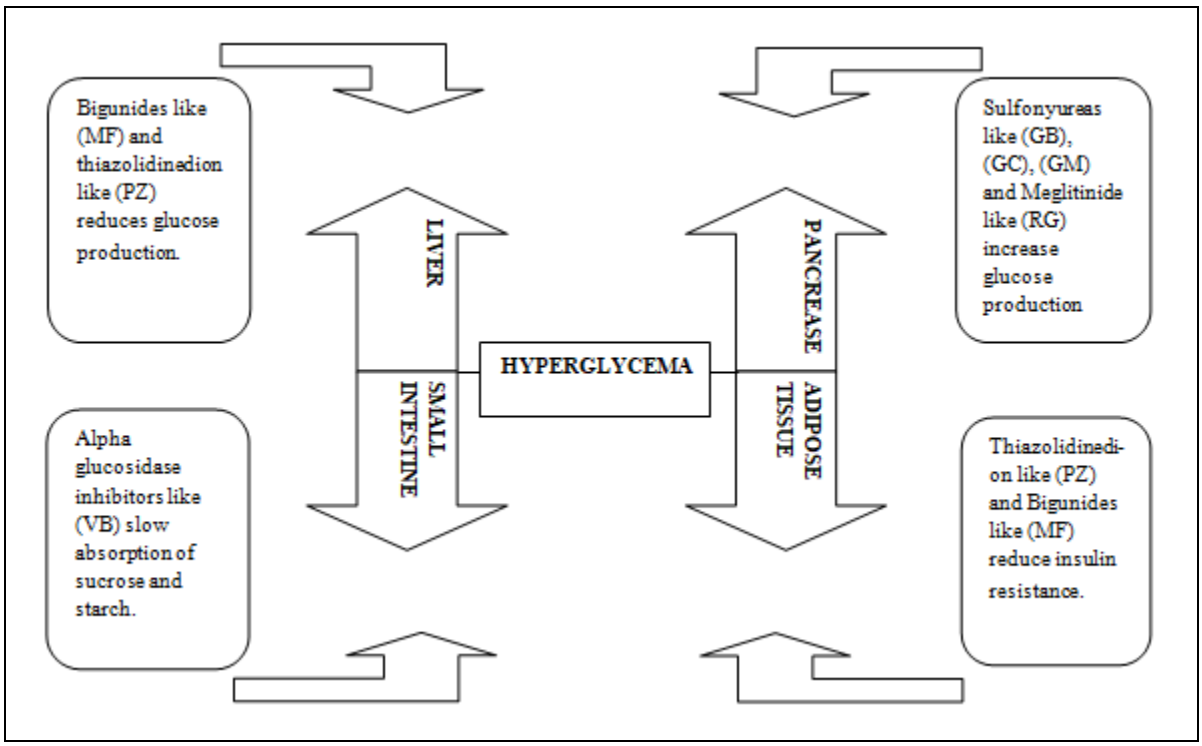

FIG. 2: SITE OF ACTION OF ANTIDIABETIC DRUGS

Pioglitazone (PZ): Pioglitazone comes under the class of thiazolidinedione. It is used in the treatment of type 2 diabetes mellitus. Pioglitazone is BCS class II drug category and has poor aqueous solubility. Pioglitazone shows a delayed onset of action [8].

Repaglinide (RG): Repaglinide is an oral antihyperglycemic agent and also known as meglitinide. It also acts as binding to β cells of the pancreas and stimulates insulin release. Repaglinide comes under the BCS class II drug category. In the upper part of the intestinal tract, it is poorly absorbed. It is an extensive hepatic first-pass metabolism and bioavailability up to 56 % [9].

Metformin (MF): Metformin is a widely accepted, oral antihyperglycemic agent. It comes under the BCS class III drug category and it has the site-specific absorption in the gastrointestinal tract and bioavailability up to 60%. The half-life of the drug is 1.5 to 4.5 h and the recommended dose is 500 mg two or three times daily [10].

Voglibose (VB): Voglibose is an alpha-glucosidase inhibitor used in the treatment of lowering the blood glucose level in diabetic patients. It also has the ability to increase glucagon-like peptide (GLP)-1 secretion in humans [11].

TABLE 1: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2010

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	outputs	
1	Glipizide	Sustained-release Glipizide microspheres emulsion (solvent diffusion-evaporation technique)	Eudragit® S100, Ethyl cellulose, ethanol, Dichloromethane, n-butanol	Particle size range % Recovery yield Encapsulation efficiency Drug release at 12 h	71-289(mm) 96.26 ± 2.15% 26.79±2.57 % 100.91± 2.86%	12
2	Acarbose	Sustained release matrix tablets (Direct compression technique)	Hydroxypropyl Methyl cellulose (HPMC), Eudragit, Lactose Microcrystalline Cellulose (MCC), Talc, Magnesium (Mg.) stearate	Uniformity of weight Friability Crushing strength % of polymer to the total tablet weight	352±2.11(mg) 0.36±0.02 % 5.4±0.71 (Kg/cm^2) 42.9 %	13

TABLE 2: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2011

S. no.	API	Type of formulation and method used	Excipient Used	Evaluation parameters		Ref. no.
				Parameter	outputs	
3	Glimepiride and Parecoxib combination	Mucoadhesive tablet (Direct compression technique)	HPMC K4M, Carbopol-934P, Sodium Carboxy Methylcellulose-H, Poly vinyl Pyrrolidone-K30 (PVP), Saccharin sodium, Amaranth, Ethanol, Mg. stearate	Average weight Thickness SurfacepH Water absorption Mucoadhesion strength Drug content	200±2.562 (mg) 8.1±0.0469 (mm) 6.68 ± 0.15 49.99 ±1.22% 23.68 ±2.59 (g) 99.97±8.54%	14
4	Metformin HCl and Pioglitazone HCl combination	Floating bilayer tablets (Direct compression technique)	HPMC K4M, HPMC E-15, Carbopol, Sodium, bicarbonate, Citric acid, Mg. stearate, Lactose, PVP	Hardness Thickness Weight variation Floating lag time Floating duration Drug content	3.5 ± 0.35 (Kg/cm^2) 0.35 ± 0.15 (mm) 5.1 ± 0.98% 2 ± 0.28 min 12 ± 1.8 h 97 ± 1.1%	15

TABLE 3: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2012

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
5	Glimepiride	Sustained release matrix tablets (Direct compression)	HPMC (15cps), Hyderxypropyl cellulose (HPC),	Thickness Hardness Friability	3.80±1.20 (mm) 3.20±0.40 (Kg/cm^2) 0.24±0.12%	16

			Ethylcellulose, MCC, Mg. stearate, Talc	Drug content *In-vitro* release study (at the end of 12 h)	99.42±1.46% 99.93%	
6	Glimepiride	Immediate-release tablets (Wet granulation Technique)	Lactose Monohydrate, Croscarmellose (CCS), Sodium starch glycolate (SSG), Povidone k 30, Avicel PH 102, Mg. stearate St-arch	Weight Variation Hardness Friability Disintegration time Assay	399.9±0.74% 3.5±0.35 (Kg/cm^2) 0.12±0.00 % 58.5±0.35 min 98.3 %	17

TABLE 4: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2013

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
7	Metformin HCl	Niosomes (Reverse phase evaporation (REV) technique) Matrix tablet (Nonaqueous wet granulation technique)	Span, Cholesterol, Diabasic calcium phosphate (DCP), Dioleoyltrimethyl ammonium-propane (DOTAP)	Mean particle size Polydispersity index Zeta potential Entrapment efficiency	223.5±2.7 µm 0.38±0.1 +8.7±1.2 mV 83.36%	18
8	Metformin HCl and Glipizide combination		HPMC K 4M, HPMC K 15M, HPMC K 100M, Starch, PVP K-30, Lactose, Citric acid, Sodium bicarbonate, MCC, Erythrosine lake, Talcum powder, Mg. stearate	Weight Variation Friability Hardness Thickness Drug content *In-vitro* release	0.43 ± 0.02% 0.21 ±0.06% 8.00 ± 0.27 (Kg/cm^2) 7.48 ± 0.05(mm) 99.01±0.12% 94.83%	19

TABLE 5: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2014

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
9	Gliclazide	Modified release tablet (Wet granulation technique)	HPMC K15M, HPMC K100M, Ethyl Cellulose, Sodium bi-carbonate, Mg. sterate, Talc, Lactose	Weight variation Hardness Friability Drug content First-order	507.2 ± 0.63 % 4.35 ±0.24 (Kg/cm^2) 0.025 % 96.57 ± 0.039 % 0.973	20
10	Metformin HCl and Acarbose combination	Bilayer tablets (Solid dispersions technique)	Eudragit RS100 , Eudragit RLPO, Potassium permanganate, Caboxymethyl cellulose sodium, MCC, Mg. stearate, Polyethylene glycol (PEG) 6000, PVP K30	Weight Thickness Hardness Friability Drug content Disintegration time Swelling	1530 ±20.20(mg) 7.2± 0.057 (mm) 12.5 ± 0.046 (Kg/cm^2) 0.55± 0.011% 98.4% 48min 30.7%	21
11	Metformin HCl	Extended-release tablets (Wet granulation technique) granulation technique	MCC PH 102, HPMC (K4M, K200M, K15M, K100M), Aerosil, Povidone, Mg. stearate, Isopropyl alcohol(IPA)	Thickness Weight variation Friability Hardness % Drug content *In-vitro* drug release	5.9(mm) 799± 0.7% 0.30% 7.1 (Kg/cm^2) 100% 53.7%	22

TABLE 6: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2015

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
12	Glimepiride	Sustained release tablet (Direct compression technique)	Carbopol , Ethylcellulose, Methocel K4 MCR, K15 MCR, K100 MCR, Xanthum gum, Lactose, Povidone K-30 Mg. stearate, Talc	Average weight Average diameter Average thickness Friability Hardness Radial tensile strength Axial tensile strength	378 ±0.8 (mg) 13.24 ± 0.36 (mm) 2.26 ± 0.32 (mm) 0.352% 20.91 ± 0.053 (Kg/cm^2) 0.445 (Kg/mm^2) 0.151 (Kg/mm^2)	23
13	Metformin HCl	Effervecent floating tablets (Wet granulation technique)	HPMC K 100M, HPMC K 200 CR , Corbopol 941 P, MCC pH 101, PVP-30K, HPMC K 100 L, Sodium bicarbonate, Colloidal silicon dioxide, Mg. stearate.	Weight variation test Thickness Diameter Hardness Friability Floating lag time Duration of floating	0.54 % 5.12 (mm) 13.9 (Kg/cm^2) 0.782 % 60 min 12 h	24
14	Glimepiride	Fast dissolving tablets (Direct compression technique)	Avicel PH 101, Mannitol, Cross povidone, Sodium saccharin, Sodium lauryl sulfate (SLS), Mg. stearate, SSG, CCS	Hardness Friability Thickness Average weight of tablet Wetting time Drug content Disintegration time	3.2 (Kg/cm^2) 0.41% 2.5 (mm) 126 (mg) 144 (Sec) 99.2% 116 (sec)	25
15	Pioglitazone HCl	Control release tablet (Solid dispersion by kneading technique)	HPMC K4M , Ethylcellulose, MCC, Mg. stearate	Diameter Thickness Average weight Hardness Friability Drug content	7.96±0.049 (mm) 2.2±0.45 (mm) 278.29±6.60 (mg) 5.0±0.356 (Kg/cm^2) 0.574±0.55 % 98.83±2.053%	26
16	Repaglinide	Mucoadhesive microspheres (Double emulsion technique)	Polycarbophil, Dichloromethane, Span80, Liquid paraffin, N-hexane	Mean particle size Percentage of drug entrapment efficiency Percentage mucoadhesion	24.30 +1.00 µm 78.9% 84.11%	27
17	Repaglinide	Nanoemulsion (o/w nanoemulsion technique)	Oleic acid, Isopropyl myristate (IPM), Glycerol triacetate (Triacetin), Caproyl 90, Propylene glycol (PG), Monocaprylic ester (Sefsol 218), Propylene glycol laurate	Droplet size Polydispersity index Viscosity Refractive index Conductivity	97.15±9.16 µL 0.198±0.017 23.857±0.541 cP 1.8502±0.008 501.18±5.76 S/m	28

TABLE 7: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2016

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
18	Glimepiride	Fast disintegrating tablets (Direct Compression technique)	CP,SSG, CCP, MCC, Mg. stearate, Aerosil, Erythritol, Orange flavor	Weight variation Thickness Hardness Friability Drug content	99.75±0.89% 2.2±0.18 (mm) 2.8±0.08 (Kg/cm^2) 0.72±0.11 % 98±0.37 %	29

				In-vitro dissolution studies	14.25 h	
				In-vivo disintegration time	26±0.39 min	
				Uniformity of weight	920.45±8.525 (mg)	
19	Metformin HCl, Pioglitazone and Glimepiride combination	Core-in-cup tablet (Direct compression technique)	HPMCK100, PVPK30, Microcrystalline cellulose powder (MCCP), Mg. stearate, Talc, Aerosil, SSG, SLS	Thickness Diameter Hardness Friability Disintegration time Drug content Floating lag time	7.02±0.052 (mm) 13.08±0.018(mm) 6.92±0.582 (Kg/cm^2) 0.42±0.055 % 2.15±0.062 min 101.42±0.548% 5.2 min	30
20	Metformin and Sitagliptin combination	Bilayer tablets (Direct compression technique)	HPMC K100M, Sodium carboxy methyl cellulose, Lactose, MCC, Pre gelatinized starch, CCS, SSG, Crosspovidone, Sodium bicarbonate, Mg. stearate, IPA, Ferric iron oxide red	Total floating time Tablet density Swelling study Average weight Hardness Thickness Friability Drug content Disintegration time Cumulative % drug release *In-vitro* drug release Weight variation	18- 24 h 0.846 g/ml 97.61% 945.07 ±1.38 (mg) 6.7 ± 0.5 (Kg/cm^2) 6.5 ± 0.63 (mm) 0.75% 99.67 ±0.42 % 52 ± 2.5 min 92.20% 97.65% 449.25±1.82%	31
21	Acarbose	Floating tablets (Direct compression technique)	HPMC K4M, Carbopol-934P, Sodium bicarbonate, Tartaric acid, Citric acid, Lactose, Talc, MCC, Mg. stearate	Hardness Friability Thickness Diameter Percentage of drug content Lag time Swelling study Avg. Wt	4.58±0.192 (Kg/cm^2) 0.1592±0.0196 % 5.60±0.0088 (mm) 11.22±0.00095 (mm) 96.83±6.18% 38.33 ± 3.55 min 96% 319.2±0.8 (mg)	32
22	Nateglinide	Sustained released tablet (Direct compression technique)	HPMC K15M, Xanthum gum, Guar gum, Avicel PH 102, Mg.stearate, Talc	Thickness Hardness % Friability % Drug content *In-vitro* dissolution study	4.91±0.23 (mm) 5.6±0.152 (Kg/cm^2) 0.68 % 100.21±0.20 % 95%	33
23	Glibenclamide and Metformin HCl combination	Bilayer matrix Tablet (Direct compression technique)	Lactose, MCC, Mg. stearate, Aerosil, Starch, HPMC K100M, HPMC 4KM	Thickness Diameter Hardness Weight variation Friability Assay % yield	0.4 (mm) 1.3 (mm) 4 (Kg/cm^2) 4.2% 0.7% 99.73% 80%	34
24	Nateglinide	Floating microspheres (Emulsion solvent evaporation technique)	Ethylcellulose, Eudragit S-100, Ethanol, Dichloromethane, Tween-80	Average particle size Percentage floating Floating time Drug entrapment efficiency	66 µm 78% 15 min 85.95%	35

TABLE 8: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2017

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
25	Glimepiride	Sublingual tablet (Direct compression technique)	Mg-stearate, Mais starch, Sucralose, Lemon flavor,	Assay Friability Weight variation	103% 0.40% 0.1141%	36

			Aerosil 200, Aerosil, Flulac, Dicalcium phosphate	Hardness Disintegration time	4.5(Kg/cm^2) 21 sec	
26	Glimepiride	Sustained release matrix tablet (Direct compression technique)	HPMCK4, PVA, Carbopol, Mannitol, MCC, Talc,L actose	Weight variation Hardness Friability Thickness Content uniformity *In-vitro* drug release	351.66±0.47% 7.25±0.014 (Kg/cm^2) 0.67±0.014% 6.46±0.094(mm) 99.51±0.004 % 94.864 %	37
27	Pioglitazone HCl	Control release tablets	HPMC K4M, Ethyl cellulose, MCC, Mg. stearate	Hardness Friability Drug Content *In-vitro* drug release	5.5±0.324(Kg/cm^2) 0.553±0.34% 99.314±2.02% 98.73±2.12%	38
28	Pioglitazone HCl	Mouth dissolving tablets (Direct compression technique)	Crospovidone , CCS, SSG, MCC, Lactose, Talc, Mg. stearate, Aspartame	Hardness Friability Thickness Disintegration time Wetting time Drug content	3.7 (Kg/cm^2) 0.68% 4.23(mm) 34 min 98.3 sec 96.5%	39
29	Pioglitazone HCl	Mouth dissolving tablets (Wet granulation technique)	Crospovidone, CCS, SSG, MCC, Lactose, Talc, Mg. stearate, Aspartame	Hardness Friability Thickness Disintegration time Wetting time Drug content	3.5(Kg/cm^2) 0.74% 4.25(mm) 27 min 14 sec 96.5%	
30	Nateglinide	Buccal films (solvent evaporation technique)	Chitosan, Carbopol, PVP, HPMC, PG	Thickness Weight Fold. end Surface pH Percentage moisture absorption (PMA) Percentage moisture loss (PML) Swelling percentage Drug content	0.48 ±0.02 (mm) 178.23 ±0.91 (mg) 320±5.0 6.73±0.005 5.21±0.07% 5.97±0.12% 120.9±0.9% 49.50±0.22%	40

TABLE 9: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2018

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				Parameter	Outputs	
31	Metformin HCl	Orodispersible tablets (Direct compression technique)	Treated agar, Avicel-101, Mg. stearate, Talc, Manitol	Hardness Friability Wetting time *In-vitro* dispersion time Disintegration time Drug content	4±0.23 (Kg/cm^2) 0.4 % 26.66 sec 15.60 sec 11.4 min 7.82 %	41
32	Glimepiride	Sustained release tablet (Direct compression technique)	Tamrind seeds, Ethylcellulose, MCC, Lactose, Talc, Mg. stearate	Diameter Thickness Weight variation Hardness Friability Drug content	7.98±0.021 (mm) 4.1±0.05 (mm) 323.79±0.59% 6.2±0.08% 0.56±0.00% 100.55±0.021%	42
33	Pioglitazone HCl	Immediate release tablets (Direct Compression technique)	CCS: CP, CP: SSG, SSG: CCS, MCC, Lactose, Talc, Magnesium dioxide (MgO)	Hardness Friability Thickness Disintegration time Wetting time Drug content *In-vitro* drug Release	4.2 ±0.027 (Kg/cm^2) 0.92±0.212 % 3.2±0.40 (mm) 19±1.63 min 40±0.21 min 98.7±0.102 % 99.3±0.33 %	43

34	Pioglitazone HCl and Metformin HCl combination	Dual release tablet (Hot melt Granulation technique)	Avicel PH 102, Copovidone, SSG, Crospovidone, Red iron oxide, Mg. stearate	Average weight Thickness Hardness Friability Disintegration time Assay	1052±4.9 (mg) 5.99±0.02 (mm) 85 ± 4.18 (Kg/cm^2) 0.21% 68 min 99.82%	44
35	Nateglinide	Floating tablets (Direct compression technique)	Ethyl Cellulose, Carbopol 930, Sodium bicarbonate, citric acid, PVP k-30, Talc, Mg. stearate	Weight variation Thickness Hardness Friability Drug content Total floating time *In-vitro* drug release studies	499 ± 0.236 % 5.6 ± 0.03 (mm) 5.5 ± 0.237 (Kg/cm^2) 0.35 ± 0.078% 100.99 ± 0.14% >24 min 98.92%	45
36	Repaglinide	Sustained release matrix (Wet granulation technique)	HPMC K 100M, HPMC K4M, HPMC K 15M, Talc, PVP K30, Calcium Stearate, CCS, IPA	Thickness Hardness Friability Drug content *In-vitro* dissolution study	1.87±0.09 (mm) 6.2±0.10 (Kg/cm^2) 0.30±0.17% 99.14% 99.15%	46
37	Empagliflozin	Spherical agglomerates (Direct compression technique)	*Caesalpinia spinosa*, HPMCK100M, Sodium alginate, Mg. sterate, MCCPH112	Diameter Thickness Hardness Friability Drug content	7.03±0.03 (µm) 2.49±0.04 (mm) 8.31±0.05(Kg/cm^2) 0.41±0.03% 99.85±0.13%	47

TABLE 10: RESEARCH WORK CARRIED OUT BY RESEARCHERS FOR ANTIDIABETIC FORMULATION AND EVALUATION PUBLISHED IN 2019

S. no.	API	Type of formulation and method used	Excipient used	Evaluation parameters		Ref. no.
				parameter	Outputs	
38	Gliclazide	Poorly water-soluble Gliclazide tablet (Direct compression technique)	Starch-1500, Spray-dried Lactose, SSG, Mg. stearate, Cross povidone	Weight variation Friability Hardness Disintegration time Drug content	1.17 ± 0.05% 0.16 ± 0.04 % 3.2 ± 0.45 (Kg/cm^2) 21 ± 3.0 min 99.87 ± 0.51%	48
39	Canagliflozin	Solid Dispersions (Solvent evaporation method)	Eudragit® E PO, Methyl methacrylate,	Solubility in distilled water Solubility in 0.75% SLS solution *In-vitro* dissolution	0.10 ± 0.005 (mg/ml) 10.08 ± 0.506 (mg/ml) 80%	49

CONCLUSION: Over the past decade, several research were carried out for the development and evaluation of fast dissolving and controlled release formulations for anti-diabetic drugs. For the drug which possesses limited or poor solubility were considered for solubility enhancement approaches. Various formulations were developed with improved solubility by using techniques as wet granulation, niosomal drug delivery, nanoemulsion, sublingual tablets, buccal films, mouth dissolving tablets, orodispersible tablets, spherical agglomerates and solid dispersion. This resulted in improvement of drugs bioavailability. Similarly, sustain or control release dosage forms were developed with the purpose of maintaining drug concentration within a therapeutic range over a period of time. This is achieved through the development of floating tablets, effervescent floating tablets, floating or mucoadhesive tablets. Such dosage forms were useful for the chronic treatment of type 2 diabetes mellitus. This review emphasizes on the management of type 2 diabetes mellitus through the formulation of a dosage form to maintain blood sugar level, which resulted in patient compliance.

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